

Camas Creek Subbasin Five-Year Review

HUC 17040220



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Camas Creek Subbasin Five-Year Review

HUC 17040220

December 2016



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Executive Summary

The *Camas Creek Subbasin Five-Year Review* is a review of total maximum daily loads and other water quality concerns of the water bodies in the Camas Creek hydrologic unit (hydrologic unit code 17040220). This review was developed to comply with Idaho Code §39-3611(7) which requires that approved TMDLs be reviewed for progress and revision every five years. The review describes current water quality status, pollutant sources, and recent pollution control efforts in the Camas Creek subbasin, located in southcentral Idaho.

The *Five-Year Review* describes 27 assessment units (AUs) of concern. It includes 5 AUs on Camas Creek; 2 AUs on reservoirs; and 20 AUs on tributaries. Some of the AUs may have multiple pollutants of concern on the same stream segments. The *Five-Year Review* describes the status of the AUs as seen in the 2012 Integrated Report; the beneficial use status of the AUs; and a review of the Beneficial Use Reconnaissance Program (BURP) monitoring results for each AU.

The *Five-Year Review* was used to upgrade the current water quality status of the Camas Creek TMDL (EPA approved August 2005); and provide more current assessment information for a much broader set of streams. As described in Section 1, the purpose of this subbasin review is to provide a status-check of surface water current conditions, total maximum daily load (TMDL) implementation efforts, and water quality trends in the Camas Creek subbasin. As this *Five-Year Review* is structured as a reference manual on the 27 AUs, each AU has its own set of descriptions and conclusions. The reader is advised to study each AU as a stream component of the Camas Creek Subbasin.

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1 Introduction

1.1 Purpose and Need

The purpose of this subbasin review is to provide a status-check of surface water current conditions, total maximum daily load (TMDL) implementation efforts, and water quality trends in the Camas Creek subbasin (hydrologic unit code 17040220). The need for this review is to satisfy Idaho Code and regulatory commitments.

1.2 Authority

This watershed review has been prepared as per Idaho Code §39-3611(7) and as prescribed in the 2014 Performance Partnership Agreement with the US Environmental Protection Agency (EPA).

Direction for 5-year reviews is laid out in Idaho Code as follows:

The director shall review and reevaluate each TMDL, supporting subbasin assessment, implementation plan(s) and all available data periodically at intervals of no greater than five (5) years. Such reviews shall include the assessments required by section 39-3607, Idaho Code, and an evaluation of the water quality criteria, instream targets, pollutant allocations, assumptions and analyses upon which the TMDL and subbasin assessment were based. If the members of the watershed advisory group, with the concurrence of the basin advisory group, advise the director that the water quality standards, the subbasin assessment, or the implementation plan(s) are not attainable or are inappropriate based upon supporting data, the director shall initiate the process or processes to determine whether to make recommended modifications. The director shall report to the legislature annually the results of such reviews. (Idaho Code §39-3611(7))

The annual Performance Partnership Agreement (PPA) between EPA Region 10 and the Idaho Department of Environmental Quality (DEQ) serves as the work plan for DEQ's Water Quality Division. The 2014 PPA is effective for calendar year 2014. The agreement aligns DEQ and EPA Region 10 priorities and defines expected environmental outcomes. Through this agreement, DEQ and EPA work together more efficiently in managing Idaho's water resources.

2 Subbasin Water Quality Review

A water body assessment entails analyzing and integrating multiple types of water body data to address three primary objectives:

- Determine the beneficial use support of a water body.
- Determine the degree of biological integrity.
- Compile descriptive information about the water body.

The Clean Water Act and Idaho water quality standards drive the assessment process and DEQ reporting requirements for the §303(d) list, §305(b) report, subbasin assessments, and legislative reports (Grafe et al. 2002). Beneficial uses are designated by the legislature and are identified in the water quality standards by water body unit.

2.1 Beneficial Uses

Surface water beneficial use designations are defined and listed in the Idaho water quality standards (IDAPA 58.01.02.100–160). These include uses that are applied on a water body-specific basis (aquatic life, recreation, domestic water supply) and uses that are applied to all waters of the state (agricultural and industrial water supply, wildlife habitat, and aesthetics).

Water bodies with specific use designations are listed in tables in sections 110–160 of the water quality standards following the Idaho water body identification (WBID) classification system (see below for explanation). Unless broken out separately in the tables, use designations listed in the tables as the standards for a WBID unit apply to all perennial segments of waters included within that particular WBID unit. Usually these are tributaries but in a few cases include nearby disconnected waters, since the WBID system has to encompass all waters in the state.

2.2 Water Quality Standards

Idaho water quality standards (IDAPA 58.01.02) list beneficial uses and set water quality goals for waters of the state. Idaho water quality standards require that surface waters of the state be protected for beneficial uses, wherever attainable (IDAPA 58.01.02.050.02). Beneficial uses are protected by a set of water quality criteria, which include numeric criteria for pollutants such as bacteria, dissolved oxygen, pH, ammonia, temperature, and turbidity, and narrative criteria for pollutants such as sediment and nutrients (IDAPA 58.01.02.250–251) (Table 4).

Table 1. Selected numeric criteria supportive of beneficial uses in Idaho water quality standards.

Parameter	Primary Contact Recreation	Secondary Contact Recreation	Cold Water Aquatic Life	Salmonid Spawning ^a
Water Quality Standards: IDAPA 58.01.02.250–251				
Bacteria				
• Geometric mean	<126 <i>E. coli</i> /100 mL ^b	<126 <i>E. coli</i> /100 mL	—	—
• Single sample	≤406 <i>E. coli</i> /100 mL	≤576 <i>E. coli</i> /100 mL	—	—
Temperature^c	—	—	22 °C or less daily maximum; 19 °C or less daily average Seasonal Cold Water: Between summer solstice and autumn equinox: 26 °C or less daily maximum; 23 °C or less daily average	13 °C or less daily maximum; 9 °C or less daily average Bull Trout: Not to exceed 13 °C maximum weekly maximum temperature over warmest 7-day period, June–August; not to exceed 9 °C daily average in September and October
EPA Bull Trout Temperature Criteria: Water Quality Standards for Idaho, 40 CFR Part 131				
Temperature	—	—	—	7-day moving average of 10 °C or less maximum daily temperature for June–September

^a During spawning and incubation periods for inhabiting species

^b *Escherichia coli* per 100 milliliters

^c Temperature exemption: Exceeding the temperature criteria will not be considered a water quality standard violation when the air temperature exceeds the ninetieth percentile of the 7-day average daily maximum air temperature calculated in yearly series over the historic record measured at the nearest weather reporting station.

E. coli is unique in that it has trigger single sample values of 406 colony-forming units per 100 milliliter (cfu/100 mL) for primary contact recreation and 576 cfu/100 mL for secondary contact recreation. A single sample above these trigger values does not in itself constitute a violation of water quality standards; it simply calls for additional samples to evaluate bacteria concentrations against the geometric mean standard. The target developed for bacteria impairment is a geometric mean concentration of 126 cfu/100 mL. This mean is calculated from five samples taken 5–7 days apart over a 30-day period (IDAPA 58.01.02.251.01). A geometric mean is used to minimize random variability in the data.

Narrative criteria for excess sediment are described in the water quality standards:

Sediment shall not exceed quantities specified in Sections 250 and 252, or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in Subsection 350. (IDAPA 58.01.02.200.08)

Narrative criteria for excess nutrients are described in the water quality standards:

Surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses. (IDAPA 58.01.02.200.06)

Narrative criteria for floating, suspended, or submerged matter are described in the water quality standards:

Surface waters of the state shall be free from floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses. This matter does not include suspended sediment produced as a result of nonpoint source activities. (IDAPA 58.01.02.200.05)

DEQ's procedure to determine whether a water body fully supports designated and existing beneficial uses is outlined in IDAPA 58.01.02.050.02. The procedure relies heavily upon biological parameters and is presented in detail in the *Water Body Assessment Guidance* (Grafe et al. 2002). This guidance requires DEQ to use the most complete data available to make beneficial use support status determinations.

2.3 Water Body Numbering System

Water bodies are accounted for in the water quality standards using water body identification numbers (WBIDs). WBIDs are further subdivided for assessment purposes into assessment units (AUs).

2.3.1 WBID

The Idaho WBID system is a geo-referenced network of Idaho water bodies based on a combination of two hydrography scales: 1:100,000 and 1:250,000. Water bodies are coded according to a 1:250,000 hydrography and named based on a 1:100,000 hydrography. Some water bodies were combined or split based on land use considerations. Canals (unless they follow a natural channel), stock ponds, and tailing ponds are not coded in the system.

The numbering or coding system of the WBID is based on the US Geological Survey (USGS) cataloging units in Idaho. USGS developed hydrologic unit codes (HUCs) as a national standard

for water resources planning and data management. In the WBID, each cataloging unit (4th-field HUC or 8-digit code) is numbered starting at the pour point (Grafe et al. 2002). The WBIDs for the Camas Creek subbasin are listed in Table 2 and pictured in Figure 1. Assessment units (AUs), also listed in Table 2, are discussed below.

Table 2. WBIDs of the Camas Creek subbasin (HUC 17040220).

WBID	AU	Description
US-1	17040220SK001	Camas Creek - Elk Creek to Magic Reservoir
US-2	17040220SK002	Camp Creek - source to mouth
US-3	17040220SK003	Willow Creek - Beaver Creek to mouth
US-4	17040220SK004	Beaver Creek - source to mouth
US-5	17040220SK005	Willow Creek - source to Beaver Creek
US-6	17040220SK006	Elk Creek - source to mouth
US-7	17040220SK007	Camas Creek - Soldier Creek to Elk Creek
US-8	17040220SK008	Deer Creek - Big Deer Creek to mouth
US-9	17040220SK009	Deer Creek - source to and including Big Deer Creek
US-10	17040220SK010	Powell Creek - source to mouth
US-11	17040220SK011	Soldier Creek - Wardrop Creek to mouth
US-12	17040220SK012	Soldier Creek - source to and including Wardrop Creek
US-13	17040220SK013	Camas Creek - Corral Creek to Soldier Creek
US-14	17040220SK014	Threemile Creek - source to mouth
US-15	17040220SK015	Corral Creek - confluence of East Fork and West Fork Corral Creeks to mouth
US-16	17040220SK016	East Fork Corral Creek - source to mouth
US-17	17040220SK017	West Fork Corral Creek - source to mouth
US-18	17040220SK018	Camas Creek - source to Corral Creek
US-19	17040220SK019	Chimney Creek - source to mouth
US-20	17040220SK020	Negro Creek - source to mouth
US-21	17040220SK021	Wildhorse Creek - source to mouth
US-22	17040220SK022	Malad River - source to mouth
US-23	17040220SK023	Mormon Reservoir
US-24	17040220SK024	Dairy Creek - source to Mormon Reservoir
US-25	17040220SK025	McKinney Creek - source to Mormon Reservoir
US-26	17040220SK026	Spring Creek Complex
US-27	17040220SK027	Kelly Reservoir
WBID = Water Body Identification System. This system is incorporated into IDAPA 58.01.02.150.22 (Camas Creek Subbasin) as a descriptor of the stream AU.		
AU = Assessment Unit number, which identifies the stream watershed by the 8-digit HUC (Hydrologic Unit Code) number followed by the two-letter basin descriptor and the stream order format (3 digit number). The AU number also corresponds to the IDAPA WBID Number for the same stream AU. See Section 2.3.2.		

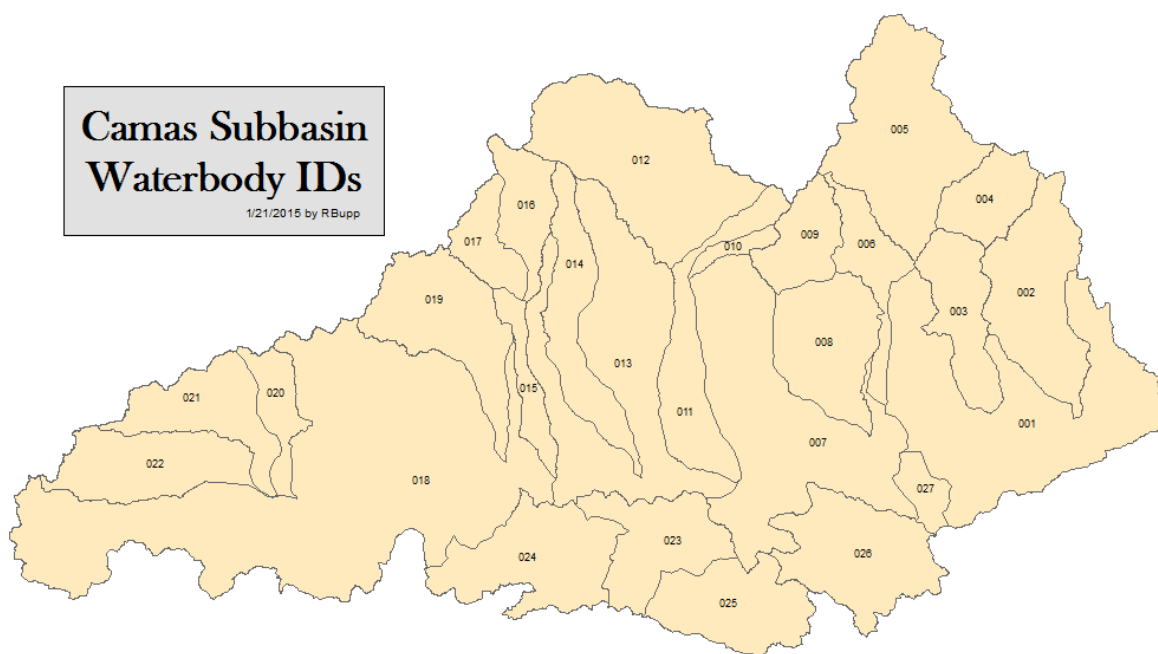


Figure 1. Camas Creek subbasin water body IDs.

2.3.2 Assessment Unit Delineation

Prior to 2002, impaired waters were defined as stream segments with geographical descriptive boundaries. In 2002, DEQ began identifying stream segments AUs instead of non-uniform stream segments and defining the use support of stream AUs by five categories in the Integrated Report. AUs now define all the waters of the state of Idaho. These units and the methods used to describe them can be found in the *Water Body Assessment Guidance II* (Grafe et al. 2002).

AUs are groups of similar streams that have similar land use practices, ownership, or land management. Stream order, however, is the main basis for determining AUs. Because AUs are subsets of WBIDs, they tie directly to the water quality standards so that beneficial uses defined in the water quality standards are clearly tied to streams on the landscape.

An AU is coded as follows:

- 2-letter state code
- 8-digit hydrologic unit code
- 2-letter basin descriptor
- 3-digit WBID_2-digit stream order

ID 17040220 SK 012_03 → ID17040220SK012_03

2.4 Review by Water Body ID

This section presents an overview of each WBID in the Camas Creek subbasin, including past water quality conditions, current conditions as evidenced by data collected as part of this 5-year review, and a review of the status of the 2005 TMDL.

2.4.1 Camas Creek (US-1)

For an overview of this WBID, see Figure 2.

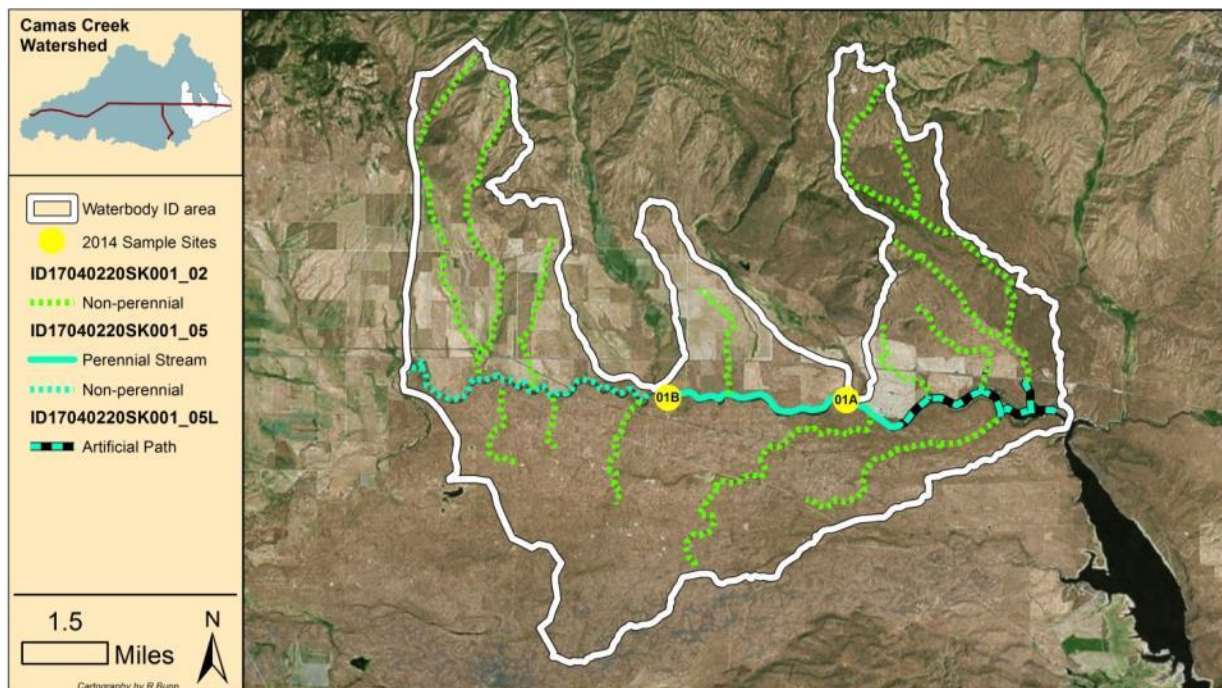


Figure 2. US-1, Camas Creek – Elk Creek to Magic Reservoir.

2.4.1.1 Assessment Units

AU ID17040220SK001_02 includes the 1st- and 2nd-order nonperennial tributaries contributing to the 5th-order of Camas Creek, totaling 48.7 miles. Segments are ephemeral/episodic exhibiting flows only in direct response to snowmelt, precipitation events, or irrigation runoff.

AU ID17040220SK001_05 is the 5th-order of Camas Creek, from Elk Creek to the backwaters of Magic Reservoir. Perennial flow in this AU is a result of discharge from Willow Creek. Flow in the Camas Creek channel upstream of Willow Creek is ephemeral.

AU ID17040220SK001_05L is the downstream extent of Camas Creek. When Magic Reservoir is filled, this AU is inundated under reservoir waters. The conditions presented by the unpredictable and variable water levels are representative of neither stream nor lake systems. The channel is considered an artificial path (Table 3).

Table 3. Camas Creek (US-1) assessment units.

Idaho’s 2012 Integrated Report				AU		Stream Segment			
Identified to have zero flow				ID17040220SK001_02		Fricke Creek Minnehaha Creek Northside Slough Poison Creek Spring Creek Unnamed tributaries of Camas Creek Elk Creek to Magic Reservoir			
Category 2: Full support				ID17040220SK001_02		All segments; 48.7 miles			
Category 3: Unassessed Waters				ID17040220SK001_05L		Magic Reservoir—Camas Creek; 290.08 acres			
Category 4a: Impaired Waters with approved TMDLs				ID17040220SK001_05		Camas Creek—Elk Creek to Magic Reservoir; 14.81 miles			
Beneficial Use		_02	_05	_05L	Causes		Reference		
Cold water aquatic life		NA	NS	NA	Total phosphorus, sedimentation/siltation, water temperature		ADB: Not identified BURP: 1995STWFA040 TMDL (pg. 201): lack of flow		
Salmonid spawning		NA	NA	NA	—		—		
Primary contact recreation		NA	NA	NA	—		—		
Agricultural water supply		NA	NA	NA	—		—		
Industrial water supply		NA	NA	NA	—		—		
Wildlife habitat		NA	NA	NA	—		—		
Aesthetic		NA	NA	NA	—		—		
NA = Not Assessed, FS = Fully Supporting, NS = Not Supporting									
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	2001STWFA037	Poison Creek							Dry
02	2005STWFA046	Fricke Creek							Dry
05	1995STWFA040	Camas Creek	33.51	1.00	—	—	48.00	1.00	1.00
05	2007STFWA086	Camas Creek							Dry
05	2008STWFA043	Camas Creek							Denied access
05	2011STWFA018	Camas Creek	67.53	3.00	57.77	1.00	50.00	1.00	1.67
05L	2010SDEQA062	Camas Creek							Reservoir

2.4.1.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions.

- 5th-order flows are in direct response to spring runoff and significant precipitation events that occur in the Willow Creek catchment area.
- During low flows, the 5th-order channel of Camas Creek upstream of Willow Creek is dry (Figure 3).



Figure 3. Camas Creek assessment unit ID17040220SK001_05; dry channel at Macon Flat Road, 9/9/2014.

- The lower end of the 5th-order channel of Camas Creek is inundated by Magic Reservoir depending on seasonal storage. Conditions in this reach are entirely driven by the variability experienced by dam operation, thus the delineation of AU ID17040220SK001_05L.
- The steep and rocky topography and limited points of access of the 5th-order channel restrict dispersed use by livestock grazing and recreation. For this reason, the majority use focused at the area of the Macon Sheep Bridge/USGS gaging station (sample site 17040220-01B and Beneficial Use Reconnaissance Program (BURP) site 2011STWFA018).
- Visual observations along ID17040220SK001_05 indicate an implicit >80% stability. The streambanks remain inaccessible to livestock and recreational use, are undisturbed, and are near the habitat and hydrologic potential.
- Current sediment load spikes into Camas Creek 5th-order are upstream results of snowmelt, seasonal agriculture runoff, occasional road stormwater, and Beaver Complex Fire mass-wasting during periods of intense precipitation. These spikes are often high intensity for short durations.
- All 2nd-order tributaries are episodic drainages and appear to flow only in response to intense precipitation or snowmelt.

Flow

This water body contains the only USGS-sanctioned streamflow gage within the Camas Creek HUC (17040220). It is located just upstream of the Macon Sheep Bridge near the Blaine-Camas county line and is 0.2 mile downstream of the confluence of Willow Creek. This location is represented by sampling point 17040220-01B. Annual average and 2014 plot lines are displayed in Figure 4. This gage captures the entire volume exiting the 17040220 watershed except for any flows that may arise from storm events that enter immediately south of the gage and enter almost immediately near the Macon Sheep Bridge but just downstream of the gage.

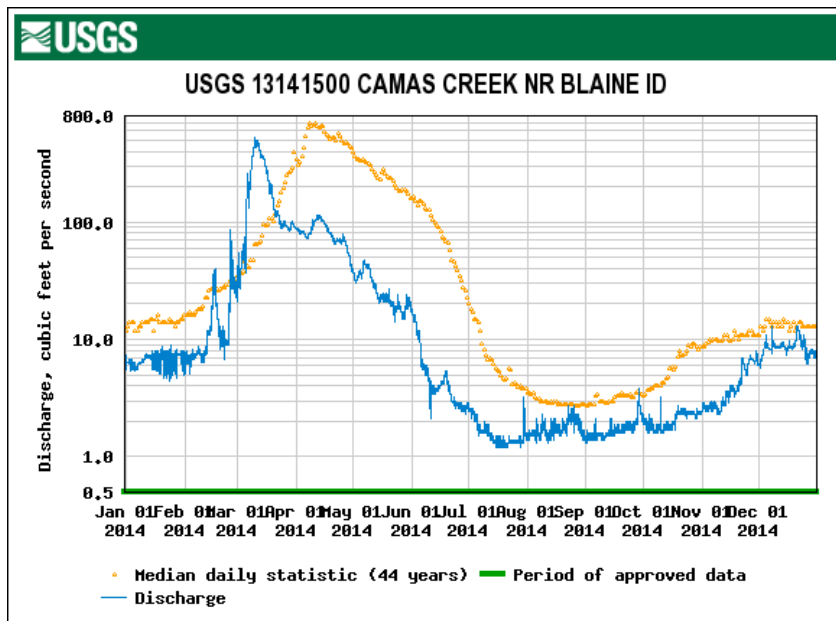


Figure 4. Camas Creek annual median/2014 daily hydrograph.

Flows for 2014 were consistently lower than the historical average, and the peak spring-melt runoff occurred earlier than normal. Late-summer flow measured at this location is directly influenced by Willow Creek discharge, as the upstream Camas Creek channel is dry up. Further discussion of this influence can be found in the flow narrative for US-3 (Willow Creek).

Additional flow measurements were captured during 2014 sampling events at sampling site 17040220-01A (Figure 5). These measurements were consistent with flows seen at the USGS gage located at 17040220-01B.

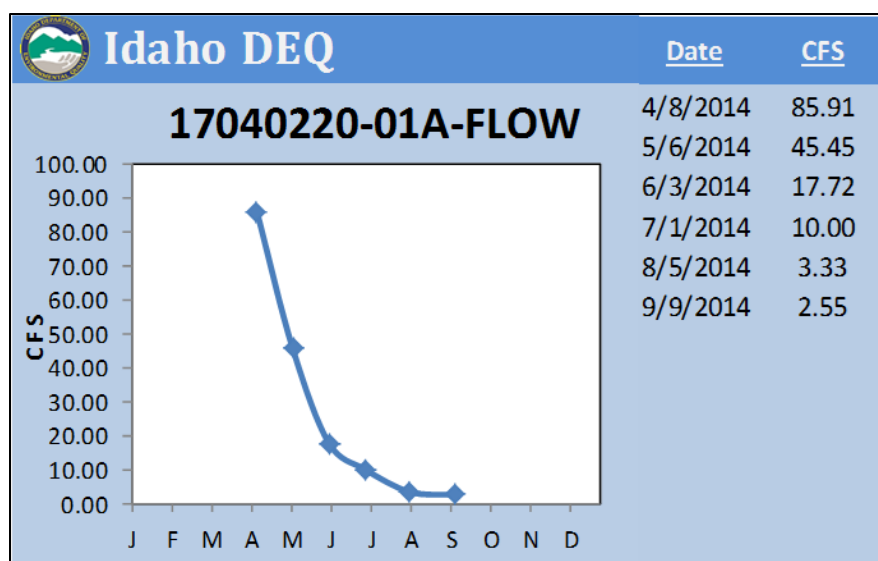


Figure 5. Flows at site 17040220-01A, 2014.

Past Conditions

The 2005 *Camas Creek Subbasin Assessment and Total Maximum Daily Load* (2005 Camas TMDL) states the following in regard to the whole of Camas Creek:

Through the subbasin assessment process, it has been identified that the water quality and beneficial uses of Camas Creek are being impacted by pollutants. The pollutants of concern in the water body have been found to be sediment, nutrients, and temperature. Nutrients are a pollutant to Camas Creek as well as to Magic Reservoir the receiving water of Camas Creek...

...Lack of flow is the largest impact to beneficial uses of Camas Creek. (DEQ 2005, pg. 201)

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 6). These efforts included composite grab samples for lab analysis of ammonia, total Kjeldahl nitrogen (TKN), total nitrogen (TN), total phosphorus (TP), total suspended solids (TSS), and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 4).



Figure 6. Sample site 17040220-01A—April and July 2014.

Table 4. Camas Creek (US-1) water chemistry.

17040220-01A Camas Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TSS	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100 mL	ft ³ /sec
4/8/2014	0.018	0.21	0.75	0.15	28	24.6	89.51
5/6/2014 ¹	0.026	0.39	0.82	0.30	69	37.3	45.45
6/3/2014 ²	<0.010	0.59	0.55	0.18	22	135.4	17.72
7/1/2014 ³	0.041	1.1	0.51	0.14	18	12.0	(<10.00)
8/5/2014	0.02	1.5	0.3	0.12	5.5	5.2	3.329
9/9/2014	0.014	1.5	0.27	0.077	<5.0	4.0	2.551

Field notes:

1. Very turbid. Flow appears to be lower than recent events as indicated by flattened grasses and woody debris piles.
2. Still very turbid, similar to previous months.
3. Flow not measured; estimated <10 cfs.

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 5). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 5. Camas Creek (US-1) nutrient summary.

17040220-01A Camas Creek						
Nutrients						
Sample Date	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TN:TP Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lb/day
April	0.21	0.75	0.15	6.4	N Limited	1.21
May	0.39	0.82	0.30	4.0	N Limited	1.22
June	0.59	0.55	0.18	6.3	N Limited	0.29
July	1.1	0.51	0.14	11.5	—	0.13
August	1.5	0.3	0.12	15.0	—	0.04
September	1.5	0.27	0.077	23.0	P Limited	0.02

¹ TN:TP ratios: values > 16 = P limiting; values < 10 = N limiting

² (TP [mg/L] * 0.08982555) Flow [ft³/sec] = TP load [lb/day]

Sediment/Total Suspended Solids

A BURP assessment was performed for ID17040220SK001_05 at the Macon Sheep Bridge in 2011. A review of the habitat data for assessment 2011STWFA018 shows total fines less than 35% and combined streambank stability of greater than 80% (Figure 7). As outlined in the general observations, this location is not representative of the entire reach; rather, this data set is a critical measurement of habitat as a result of focused impacts in this location.

Streambank Conditions				
Left				
Covered and Stable	Covered and Unstable	Uncovered and Stable	Uncovered and Unstable	
100.00%	0.00%	0.00%	0.00%	
Right				
Covered and Stable	Covered and Unstable	Uncovered and Stable	Uncovered and Unstable	
78.33%	21.67%	0.00%	0.00%	
% Fines				
	Wet Fines/Wet Total	Dry Fines/Dry Total	All Fines/All Total	
Silt/Sand (≤ 2.5 mm)	19.25%	75.47%	33.18%	
Silt/Sand/VFP (≤ 6 mm)	19.25%	75.47%	33.18%	

Figure 7. BURP assessment site 2011STWFA018 on AU ID17040220SK001_05.

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-01A to represent TSS discharge downstream from US-1. These results are discussed below.

Bank stability inventories were performed visually on the 5th-order of Camas Creek at locations that offered reasonable and safe access. Visual observation showed that cliffs and boulders that comprise the riparian zone physically restrict anthropogenic uses that would contribute to unstable banks (Figure 8). Bank instability at these locations is likely to be natural and result from fluvial influences.



Figure 8. Camas Creek canyon.

E. coli

Sampling in 2014 included analysis for *E. coli* (Table 6).

Table 6. Camas Creek (US-1) *E. coli*.

Sample Date	<i>E.coli</i>	Flow	Trigger ¹
	MPN/100 mL	ft ³ /sec	
April	24.6	89.51	--
May	37.3	45.45	--
June	135.4	17.72	--
July	12.0	(<10.00)	--
August	5.2	3.329	--
September	4.0	2.551	--

¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation

Temperature

A thermograph is deployed in this water body to capture hourly water temperature measurements. The hourly water temperature plot for 8/13/2013–10/1/2014 is displayed in Figure 9.

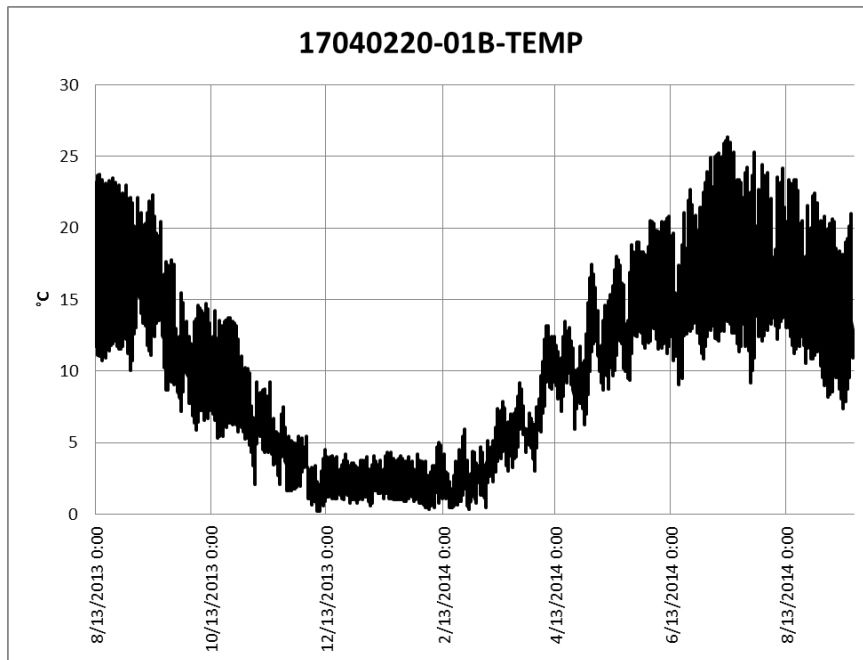


Figure 9. Camas Creek (US-1) thermograph.

2.4.1.3 TMDL Targets, Loads, and Status

The 2005 Camas TMDL set pollutant load targets for sediment, nutrients, and temperature. Past loads, current loads, and current status are displayed in Table 7.

Table 7. Camas Creek (US-1) TMDL load summary and status.

AU	TMDL Pollutant	2005 Load ^a	2014 Loads ^b	TMDL Target ^c	Target Status ^d
ID17040220SK001_02	— No TMDL —				
ID17040220SK001_05 ^e	Nutrients (lb/day TP)	130.49	1.21	Load capacity 61.55 lb/day	Target achieved
			1.22		
			0.29		
			0.13	Max. conc. 0.050 mg/L	Target exceeded
			0.04		
			0.02		
	Sediment (t/yr)	8,018.8 ^f	41.09	Load capacity 512.6 t/yr	Target achieved
			20.86		
			8.13	80% bank stability	Target achieved
			4.59		
			1.53		
	Temperature solar load ^g (kWh/day)		<1.17	2,500,000 kWh/day	Target exceeded
			2,800,000		
		All segments deficient	Shade 12%	Target exceeded	
ID17040220SK001_05L	— No TMDL —				
a. Loads identified in the 2005 Camas TMDL pgs. 201–205.					
b. Calculated from 2014 sampling results; instantaneous loads.					
c. TMDL targets prescribed in the 2005 Camas TMDL pgs. 201–205.					
d. Target status determined as described in this section's narrative.					
e. 2005 TMDL combined all Camas Creek AUs in load analysis and target prescription.					
f. The 2005 sediment load was calculated with erosion rate, bank height, and quantity of streambank stability.					
g. Target status determined as described in the 2016 Camas Creek PNV analysis.					

Sediment TMDL

The 2005 Camas TMDL states the following:

Sediment is impacting beneficial uses of Camas Creek in the form of bed load sediment. Suspended sediment measured during drought years is not impacting water quality of the stream, however bed load sediment measured in the form of percent fines indicates that sediment is impacting water quality. A value greater than 35% for percent fines was used to indicate that sediment was impacting the water body. If this was the case then stream bank erosion inventories were completed to determine if stream bank erosion was the contributor of sediment impact. The target for stream bank erosion TMDLs is 80% bank stability.

Sampling in 2014 included analysis for TSS and yielded instantaneous loads (Table 8). TSS loads are significantly lower than the sediment load identified in the 2005 Camas TMDL (8,018.8 tons/year). Although these numbers cannot be compared directly, the TSS numbers do show that the water column loads are responsive to flow and are relatively low.

Table 8. Camas Creek (US-1) total suspended solids.

17040220-01A Camas Creek Total Suspended Solids			
Sample Date	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	28	89.51	41.09
May	69	45.45	51.41
June	22	17.72	6.39
July	18	(<10.00)	< 2.95
August	5.5	3.329	0.30
September	<5.0	2.551	0.21
¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]			

The BURP assessment performed for ID17040220SK001_05 at the Macon Sheep Bridge in 2011 supports that the percent fines and streambank stability values are within the prescribed targets identified in the TMDL and that the sediment target is achieved.

Nutrient TMDL

The 2005 Camas TMDL states the following:

Nutrients are impacting the CWAL beneficial uses of Camas Creek, but as the creek discharges into a reservoir the TMDL is completed to limit nutrient delivery to the reservoir. The target for water bodies discharging into a storage system is 0.050 mg/L. This goal should aid limiting excessive delivery of nutrients to the reservoir. As a result 0.050 mg/L is the target to be used in the development of a nutrient TMDL for Camas Creek.

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. To review the performance of the TMDL, instantaneous daily loads for TP have been calculated for each sample event (Table 9). These daily loads are significantly lower than the load capacity recorded in the TMDL as 61.55 pounds per day (lb/day), and the concentrations were higher than the TMDL maximum of 0.050 milligrams per liter (mg/L). For these reasons, the TP loads are far below the daily load capacity in Camas Creek but consistently exceed the target TMDL concentration.

Table 9. Camas Creek (US-1) total phosphorus loads.

17040220-01A Camas Creek Total Phosphorus Load			
Sample Date	TP	Flow	TP Load¹
	mg/L	cfs	lbs/day
April	28	89.51	41.09
May	69	45.45	51.41
June	22	17.72	6.39
July	18	(<10.00)	< 2.95
August	5.5	3.329	0.30
September	<5.0	2.551	0.21

¹ (TP [mg/L] *0.08982555)Flow [cfs] = TP load [lbs/day]

Temperature TMDL

A temperature TMDL addendum was developed in 2016 using a potential natural vegetation (PNV) analysis to update the previous solar load estimates and targets. The addendum set individual segment shade targets and a total solar load target of 2,500,000 kWh/day (Table 10). The existing shade for each segment was found to be less than the prescribed percentages, and the resulting total solar load was 2,800,000 kilowatt hours per day (kWh/day). An excess load of 300,000 kWh/day was created by the shade deficit, which represents a need reduction in heat load of 11%.

Table 10. Camas Creek (US-1) heat load summary.

US-1 Camas Creek PNV Heat Loads¹			
AU	Target	Existing	Excess
	kWh/day	kWh/day	kWh/day
001_05	2,500,000	2,800,000	300,000

¹ Solar loading from 2016 PNV Temperature TMDL.

2.4.2 Camp Creek (US-2)

For an overview of this WBID, see Figure 10.

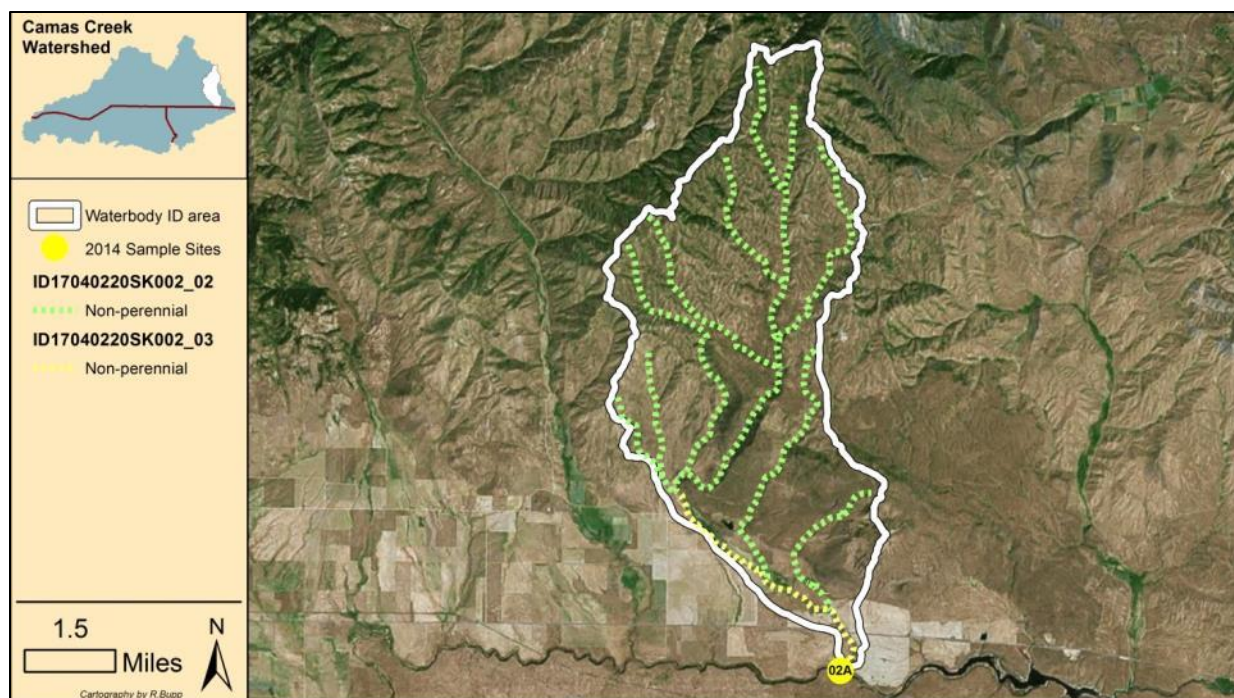


Figure 10. WBID US-2, Camp Creek – source to Camas Creek.

2.4.2.1 Assessment Units

AU ID17040220SK002_02 includes the 1st- and 2nd-order nonperennial tributaries contributing to the 3rd-order of Camp Creek, totaling 37.28 miles. Segments are ephemeral/episodic exhibiting flows only in direct response to snowmelt, precipitation events, or irrigation runoff. A beaver complex with perennially ponded water exists on Camp Creek immediately upstream of Camp Creek Road on US Bureau of Land Management (BLM) property.

AU ID17040220SK002_03 is the 3rd-order of Camp Creek, which begins at the confluence of Camp Creek and Spare Creek and continues 4.78 miles to Camas Creek. This segment is ephemeral and exhibits flow only in direct response to snowmelt and precipitation events (Table 11).

Table 11. Camp Creek (US-2) assessment units.

Idaho's 2012 Integrated Report			AU		Stream Segment				
Category 4a: Impaired waters with approved TMDLs			ID17040220SK002_02		Camp Creek – source to mouth; 37.28 miles				
			ID17040220SK002_03		Camp Creek – source to mouth; 4.78 miles				
Beneficial Use		_02	_03	Causes		Supporting Sources			
Cold water aquatic life		NS	NS	Sedimentation/siltation, water temperature		ADB: Not identified BURP: 1996STWFB027 1996STWFB041 TMDL (pg. 176): lack of flow			
Agricultural water supply		NA	NA	—		—			
Industrial water supply		NA	NA	—		—			
Wildlife habitat		NA	NA	—		—			
Aesthetic		NA	NA	—		—			
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	1996STWFB027	Camp Creek	43.18	2.00	—	—	42.00	1.00	1.50
02	1996STWFB041	Camp Creek	31.79	0.00	69.15	2.00	59.00	3.00	0.00
02	2001STWFA038	Camp Creek	Dry						
02	2007STWFA045	Spare Creek	Dry						
02	2011STWFA022	Camp Creek	55.54	3.00	—	—	45.00	1.00	2.00
03	2010SDEQA062	Camas Creek	Not assessed						

2.4.2.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions.

- 3rd-order flows measured at 17040220-02A (Figure 11) were in direct response to spring runoff. During periods of precipitation runoff flashing in late summer 2014, no discharges from Camp Creek into Camas Creek were obvious, confirming ephemeral flow regime.



Figure 11. Sample site 17040220-02A: Camp Creek confluence into Camas Creek, May and September 2014.

- The lower reaches of the 2nd-order of Camp Creek (adjacent to Camp Creek Road) lose their spring-runoff flow in early summer (Figure 12).



Figure 12. Camp Creek assessment unit ID17040220SK002_02; dry channel, 6/19/2014.

- All tributaries of Camp Creek are ephemeral and respond only to spring runoff and precipitation.
- A beaver complex exists in the ID17040220SK002_02 Camp Creek canyon, upstream of the divergence of the Camp Creek Road. This complex exists entirely on BLM property and appears to be stable and functioning.
- Upstream of the beaver complex, the Camp Creek channel is moderately incised through a historic meadow complex (Figure 13). Walking bank surveys in 2014 revealed that the channel is currently stable and is possibly aggrading in a few locations.



Figure 13. Camp Creek assessment unit ID17040220SK002_02 upstream of the beaver complex, 6/19/2014.

Flow

Flows were collected for Camp Creek at sampling location 17040220-02A, 20 meters upstream of the confluence with Camas Creek. April provided the only measurement of significant discharge at 2.00 cubic feet per second (cfs) (Figure 14). Subsequent measurements in May and June used a small portable V-notch flume to determine trace flows of 0.09 and 0.03, respectively.

A dry channel was observed during site visits in July, August, and September. Field inspections upstream confirmed that channel flows had subsided and that all tributaries in the watershed are ephemeral.

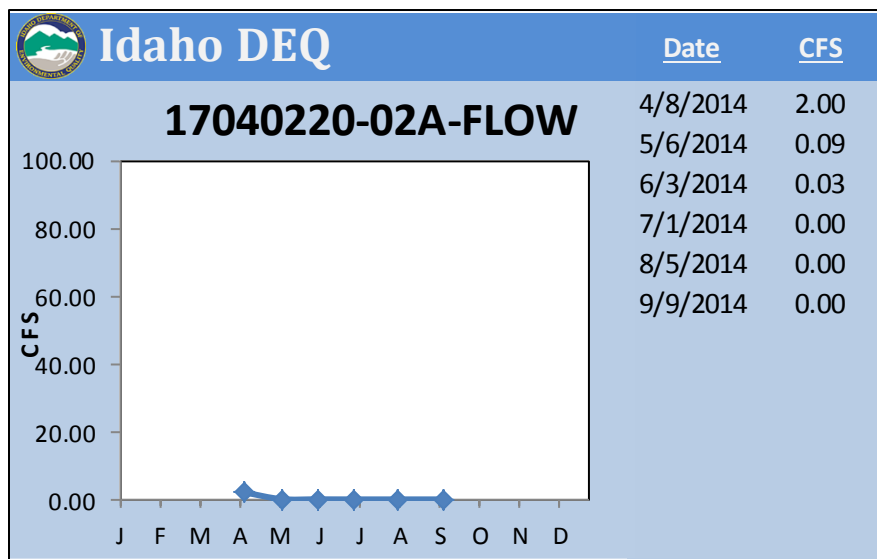


Figure 14. Flows at 17040220-02A, 2014.

Past Conditions

The 2005 Camas TMDL found that sediment and temperature were the pollutants of concern for the whole of Camp Creek, but that lack of flow was the largest impact to beneficial uses (DEQ 2005, p. 176).

Current Conditions

DEQ sampled this water body from April 2014 through September 2014. These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 12).

Table 12. Camp Creek (US-2) water chemistry.

17040220-02A Camp Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	Total Suspended Solids	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100 mL	ft ³ /sec
4/8/2014	<0.010	<0.010	0.57	0.076	<5.0	12.2	2.004
5/6/2014	<0.010	0.022	0.47	0.064	<5.0	2	0.088
6/3/2014	<0.010	0.034	0.30	0.067	<5.0	238.2	0.026
7/1/2014	—	—	—	—	—	—	dry
8/5/2014	—	—	—	—	—	—	dry
9/9/2014	—	—	—	—	—	—	dry

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 13). The TN:TP ratio is used to identify potential nutrient limitations in the water body.

Table 13. Camp Creek (US-2) nutrient summary.

17040220-02A Camp Creek						
Nutrients						
Sample Date	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TP:TN Ratio	Limits ¹	TP Load ²
	mg/L	mg/L	mg/L			lbs/day
April	<0.010	0.570	0.076	<7.6	N Limited	0.014
May	0.022	0.470	0.064	7.7	N Limited	<.001
June	0.034	0.300	0.067	5.0	N Limited	<.001
July	--	--	--	--	--	0.0
August	--	--	--	--	--	0.0
September	--	--	--	--	--	0.0

¹ TP:TN ratios -- Values > 16 = P Limiting Values < 10 = N Limiting

² (TP [mg/l] *0.08982555)/Flow [ft³/sec] = TP load [lbs/day]

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-02A to represent TSS discharge into downstream waters (Table 14). This sample site is located on AU ID17040220SK002_03 immediately upstream from the confluence with Camas Creek. TSS for ID17040220SK002_02 was not assessed in 2014.

Table 14. Camp Creek (US-2) total suspended solids.

17040220-02A Camp Creek Total Suspended Solids			
Sample Date	TSS	Flow	TSS Load¹
	mg/L	ft ³ /sec	tons/year
April	<5.0	2.004	<0.16
May	<5.0	0.088	<0.01
June	<5.0	0.026	<0.01
July	--	dry	0.0
August	--	dry	0.0
September	--	dry	0.0
¹ (TSS [mg/l] *0.016393163)Flow [ft ³ /sec] = TSS load [tons/year]			

In 2011, a BURP assessment was performed for Camp Creek downstream of Eagle Creek. A review of the habitat data for site 2011STWFA022 shows total fines of 28%, which is less than the target of 35%, supporting that the target is achieved. However, streambank stabilities were determined to be less than 80% (Figure 15).

Streambank Conditions			
Left			
Covered and Stable	Covered and Unstable	Uncovered and Stable	Uncovered and Unstable
69.00%	10.00%	0.00%	21.00%
Right			
Covered and Stable	Covered and Unstable	Uncovered and Stable	Uncovered and Unstable
50.00%	21.00%	0.00%	29.00%

% Fines			
	Wet Fines/Wet Total	Dry Fines/Dry Total	All Fines/All Total
Silt/Sand (≤ 2.5 mm)	7.56%	37.5%	17.14%
Silt/Sand/VFP (≤ 6 mm)	20.17%	44.64%	28%

Figure 15. BURP assessment site 2011STWFA022 on ID17040220SK002_02 (Camp Creek).

This BURP assessment occurred in a reach of the stream that is used as a crossing for 4×4s and ATVs. This location may not be representative of the entire reach. Rather, this assessment is a critical measurement of habitat condition as a result of focused impacts in this location. With this qualification, these data support that the percent fines are within the criteria set by the TMDL but fail the streambank stability target.

A georeferenced bank stability inspection was performed during two days in July 2014. The resulting line features and associated conditions are displayed in Figure 16.

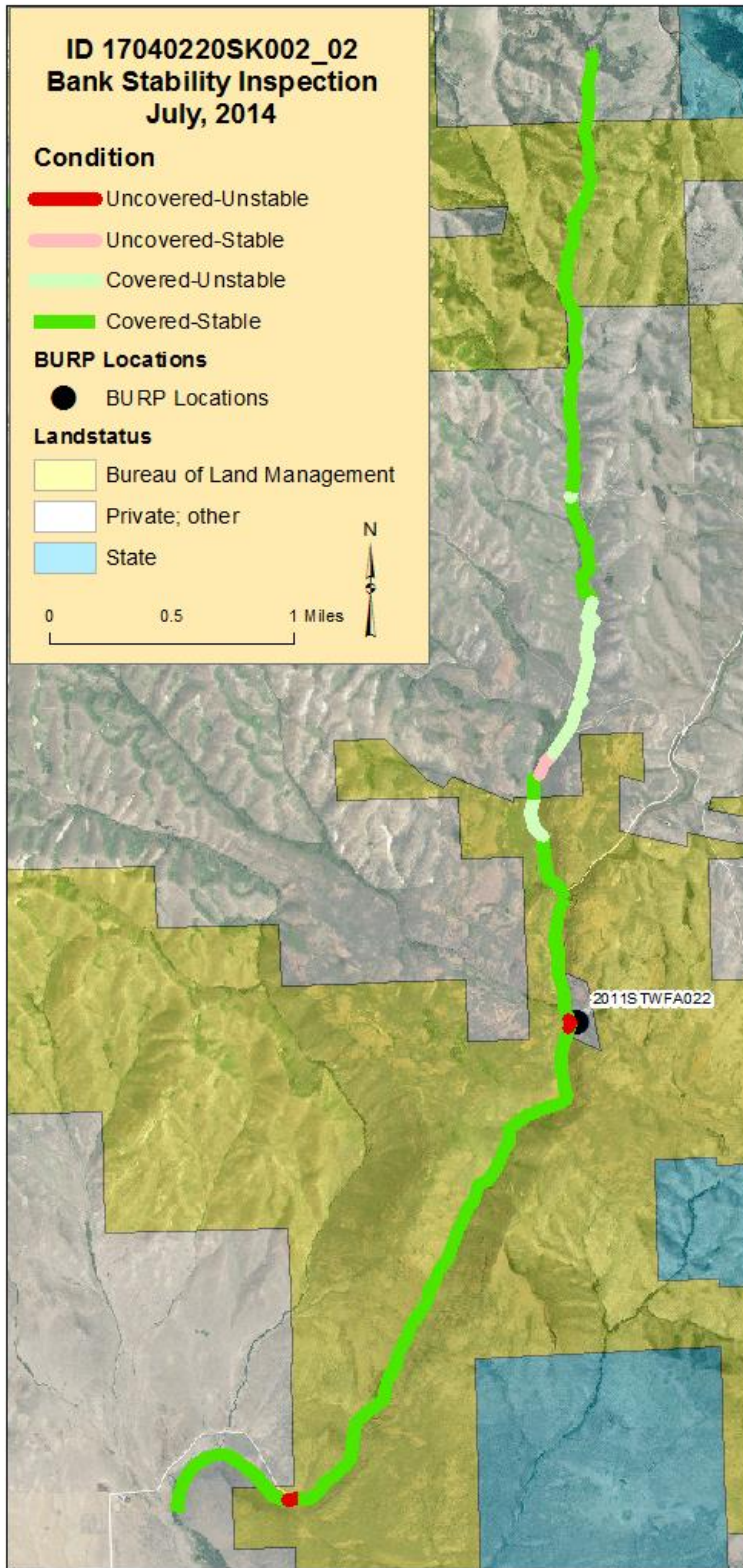


Figure 16. Bank stability inspection for Camp Creek.

The predominant condition of the inspected channel of Camp Creek is “covered-stable.” The most compromised section of Camp Creek in this AU occurs on the private land between the BLM parcels, in the historic meadow complex. This degraded reach is likely due to historic grazing impacts, and the “covered-unstable” condition is a probable indication of an incised channel with caving banks (Figure 17).



Figure 17. Camp Creek "covered-unstable" banks.

E. coli

Sampling in 2014 included analysis for *E. coli*. The sample results and measured flows are displayed in Table 15.

Table 15. Camp Creek (US-2) *E. coli*.

17040220-02A Camp Creek			
Bacteria			
Sample Date	<i>E.coli</i>	Flow	Trigger ¹
	MPN/100 mL	ft ³ /sec	
April	12.2	2.004	--
May	2.0	0.088	--
June	238.2	0.026	--
July	--	dry	--
August	--	dry	--
September	--	dry	--
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Temperature

A thermograph was deployed in this water body to capture hourly water temperature measurements. The hourly water temperature plot for 4/08/2014–7/1/2014 is displayed in Figure 18. The red line depicts the approximate date this water body first experienced zero flow. The graph indicates that flow returned for a few days in mid-June then returned to zero flow. The thermograph was removed during the July sampling event as flows remained zero.

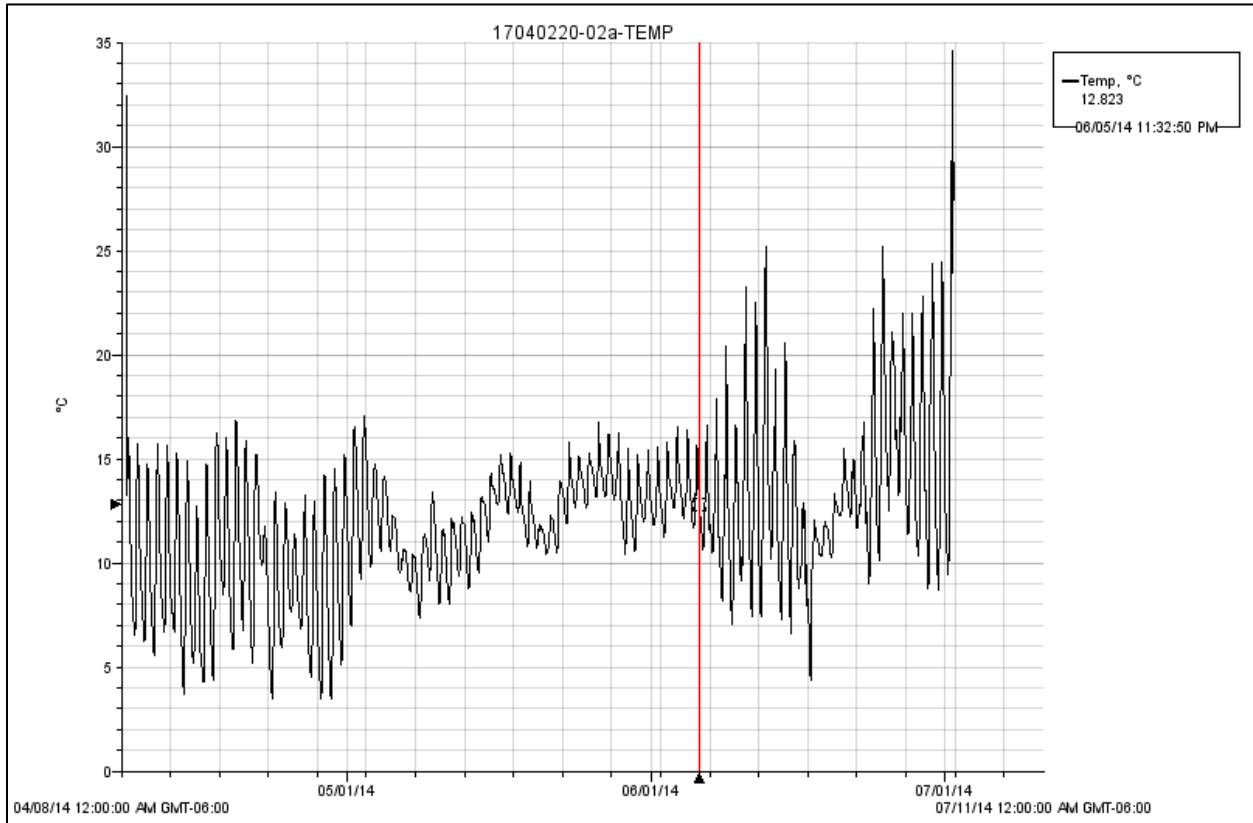


Figure 18. Camp Creek (US-2) thermograph, 2014.

An exceedance analysis was completed for this data set and can be viewed in Appendix A. For the time period analyzed, no cold water aquatic life (CWAL) exceedances occurred. During the time water was extant in this water body, the CWAL beneficial use was not impaired.

2.4.2.3 TMDL Targets, Loads, and Status

The 2005 Camas TMDL set pollutant load targets in Camp Creek for sediment and temperature. Past loads, current loads, and current status are displayed in Table 16.

Table 16. Camp Creek (US-2) TMDL load summary and status.

AU	TMDL Pollutant	2005 Load ^a	2014 Loads ^b	TMDL Target ^c	Target Status ^d
ID17040220SK002_02 ^e	Sediment (t/yr)	278.3	—	80.0 t/yr	Not reviewed
				< 35% fines	Target achieved
				80% bank stability	Target exceeded
	Temperature Solar Load ^g (kWh/day)	320,220	260,000 ^g		Target exceeded
	Shade (% canopy)		See TMDL shade analysis ^h	75-35-65-50	Target exceeded
ID17040220SK002_03 ^e	Sediment (t/yr)	278.3 ^f	<0.16		
			<0.01	80.0 t/yr	Target achieved
			<0.01	< 35% fines	Target achieved
			0.0	80% bank stability	Target exceeded
			0.0		
	Temperature Solar Load ^g (kWh/day)	320,220	150,000 ^g		Target achieved
	Shade (% canopy)		See TMDL shade analysis ^h	75-35-65-50	Target exceeded
<p>a. Loads identified in the 2005 Camas TMDL pgs. 176–180.</p> <p>b. Calculated from 2014 sampling results; instantaneous loads.</p> <p>c. TMDL targets prescribed in the 2005 Camas TMDL pgs. 176–180.</p> <p>d. Target status determined as described in this section's narrative.</p> <p>e. 2005 TMDL combined all Camp Creek AUs in load analysis and target prescription.</p> <p>f. The 2005 sediment load was calculated with erosion rate, bank height, and quantity of streambank stability.</p> <p>g. Heat loads calculated in the 2016 Camas Creek PNV analysis.</p> <p>h. Shade percentages by stream segment identified in the 2016 Camas Creek PNV analysis.</p>					

Sediment TMDL

The 2005 Camas TMDL states the following in regards to Camp Creek:

Sediment is impacting beneficial uses of Camp Creek in the form of bed load sediment. Suspended sediment measured during drought years is not impacting water quality of the stream, however bed load sediment measured in the form of percent fines indicates that sediment is impacting water quality. A value greater than 35% for percent fines was used to indicate that sediment was impacting the water body. If this was the case then stream bank erosion inventories were completed to determine if stream bank erosion was the contributor of sediment impact. The target for stream bank erosion TMDLs is 80% bank stability.

TSS for ID17040220SK002_02 was not assessed in 2014. The 2011 BURP assessment for Camp Creek downstream of Eagle Creek supports that the percent fines are within the criteria set by the TMDL but fail the streambank stability target.

Sampling in 2014 included analysis for TSS in the 3rd-order of Camp Creek (ID17040220SK002_03) (Table 14). TSS loads are significantly lower than the target sediment load identified in the 2005 Camas TMDL. Although these numbers cannot be compared directly, the TSS numbers confirm that the water column loads are responsive to flow and are relatively low at this sampling location, suggesting that the sediment load target is achieved for this AU.

Temperature TMDL

A temperature TMDL addendum was developed in 2016 using a PNV analysis to update the previous solar load estimates and targets. The 2016 Camas PNV TMDL addendum set individual segment shade targets and a total solar load target of 140,000 kWh/day and 170,000 kWh/day for AUs SK002_02 and SK002_03, respectively (DEQ 2016).

The existing shade for each segment was found to vary. Some segments meet or exceed the shade potential, and some segments are shade deficient. The calculated heat loading based on existing shade is 260,000 kWh/day for SK002_02 and 150,000 kWh/day for SK002_03 (Table 17). The second order AU lacks shade and has an excess load of 120,000 kWh/day or 46% needed reduction. The third order AU is meeting load targets.

Based on the 2016 PNV shade analysis for the temperature TMDL addendum, the following conclusions are drawn for water temperature:

- ID17040220SK002_02 is exceeding the heat loading target.
- ID17040220SK002_03 is meeting the heat loading target.

Table 17. Camp Creek (US-2) heat load summary.

US-2 Camp Creek PNV Temperature Loads ¹			
AU	Target kWh/day	Existing kWh/day	Excess kWh/day
002_02	140,000	260,000	120,000
002_03	170,000	150,000	(20,000)
¹ Solar loading from 2016 PNV Temperature TMDL.			

2.4.3 Willow Creek (US-3)

For an overview of this WBID, see Figure 19.

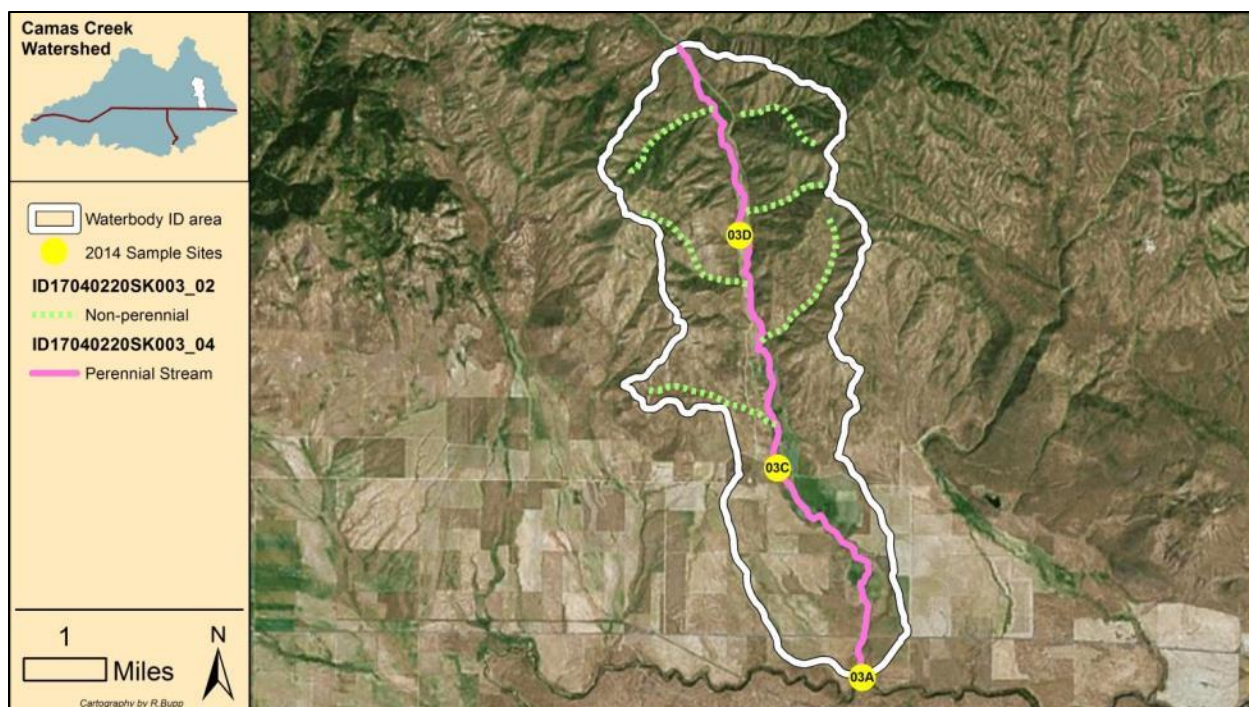


Figure 19. WBID US-3, Willow Creek – Beaver Creek to mouth.

2.4.3.1 Assessment Units

AU ID17040220SK003_02 includes the 1st- and 2nd-order tributaries contributing to the 4th-order of Willow Creek, totaling 8.99 miles. Segments are ephemeral/episodic exhibiting flows only in direct response to snowmelt, precipitation events, or irrigation runoff.

AU ID17040220SK003_04 is the 4th-order of Willow Creek. This segment begins at the confluence of Willow Creek and Beaver Creek and continues 9.36 miles to Camas Creek. This segment is perennial (Table 18).

Table 18. Willow Creek (US-3) assessment units.

Idaho's 2012 Integrated Report				AU		Stream Segment			
Category 3: Unassessed waters				ID17040220SK003_02		Willow Creek – Beaver Creek to mouth; 8.99 miles			
Category 4a: Impaired waters with approved TMDLs				ID17040220SK003_04		Willow Creek – Beaver Creek to mouth; 9.36 miles			
Beneficial Use		_02	_04	Causes			Supporting Sources		
Cold water aquatic life		NA	NS	Water Temperature			ADB: Not identified TMDL (pg. 170): Lack of shade		
Agricultural water supply		NA	NA	—			—		
Industrial water supply		NA	NA	—			—		
Wildlife habitat		NA	NA	—			—		
Aesthetic		NA	NA	—			—		
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
04	1993STWFA026	Willow Creek	22.34	0.00	—	—	13.00	1.00	0.00
04	1995STWFA042	Willow Creek	65.63	3.00	—	—	62.00	3.00	3.00
04	2011STWFA019	Willow Creek	55.98	3.00	88.59	3.00	55.00	2.00	2.67
04	2013SDEQA536	Willow Creek	—Not scored ¹ —						
¹ comments, 9/5/2013: “Stream is really full of ash from a fire upstream. Land owners have seen lots of dead fish and we decided not to electrofish because of that, we collected and measured dead fish that we found instead. Landowners also said stream was clear until a couple days ago when rain washed everything down; that it is spring fed and intermittent in sections. Many willows and grasses. Some weeds and such on right side. Two-track running on right side of stream. A few man-made pools have been created.”									

2.4.3.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within Willow Creek.

1. All stream segments comprising AU ID17040220SK003_02 are ephemeral.
2. The entire length (9.36 miles) of AU ID17040220SK003_04 is perennial (Figure 20).
3. ID17040220SK003_04 loses flow throughout the central portion of the reach, and then regains most of this flow near the mouth. This loss may be natural, or a result of an unknown diversion.
4. During snowpack runoff and precipitation events, significant sedimentation and sediment conveyance was observed as a result of Beaver Creek Complex Fire erosion.
5. An active beaver pond complex exists at the abandoned crossing at Lanman Road.



Figure 20. Sample site 17040220-03A on ID17040220SK003_04.

Flow

Flows were collected monthly for lower Willow Creek at sampling location 17040220-03A. This location is 20 meters upstream of the confluence with Camas Creek. Flows measured in April, May, and June were substantially larger than those measured in July, August, and September. This hydrograph (Figure 21) indicates influence from melting snowpack in the spring and is consistent with the USGS gauge (13141500 Camas Creek nr Blaine ID) just 200 meters downstream on Camas Creek.

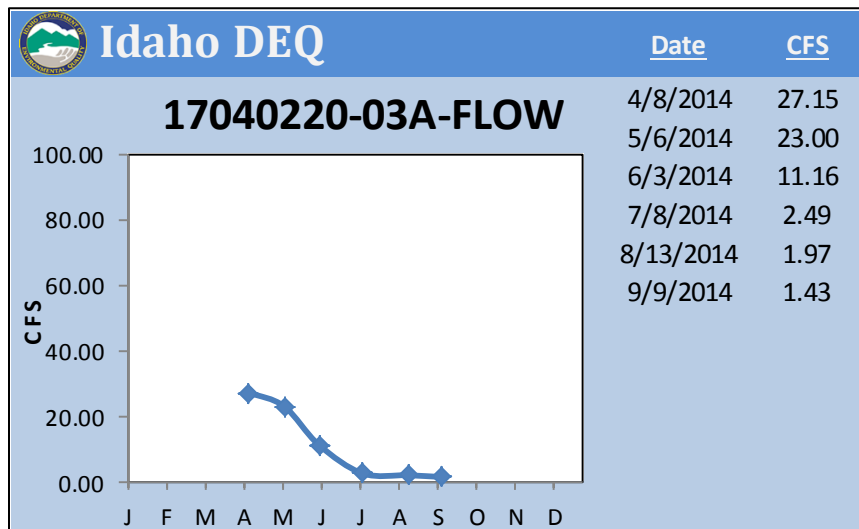


Figure 21. Flows at 17040220-03A, 2014.

Progressive flow measurements were taken in this water body in August to determine the hydrologic gain and/or loss characteristics. Flows were measured at five unique locations on 8/13/2014. The flows (Table 19) were then used to develop the proportional line feature

representing the hydrology and depicted in Figure 22, which indicates a flow loss mid/channel. This flow volume returns near the mouth.

Table 19. Flows at 17040220-03, 8/13/14.

<u>Site</u>	<u>Flow</u>
05A	2.732
03D	3.100
03C	0.233
03B	bvr pond
03A	1.967

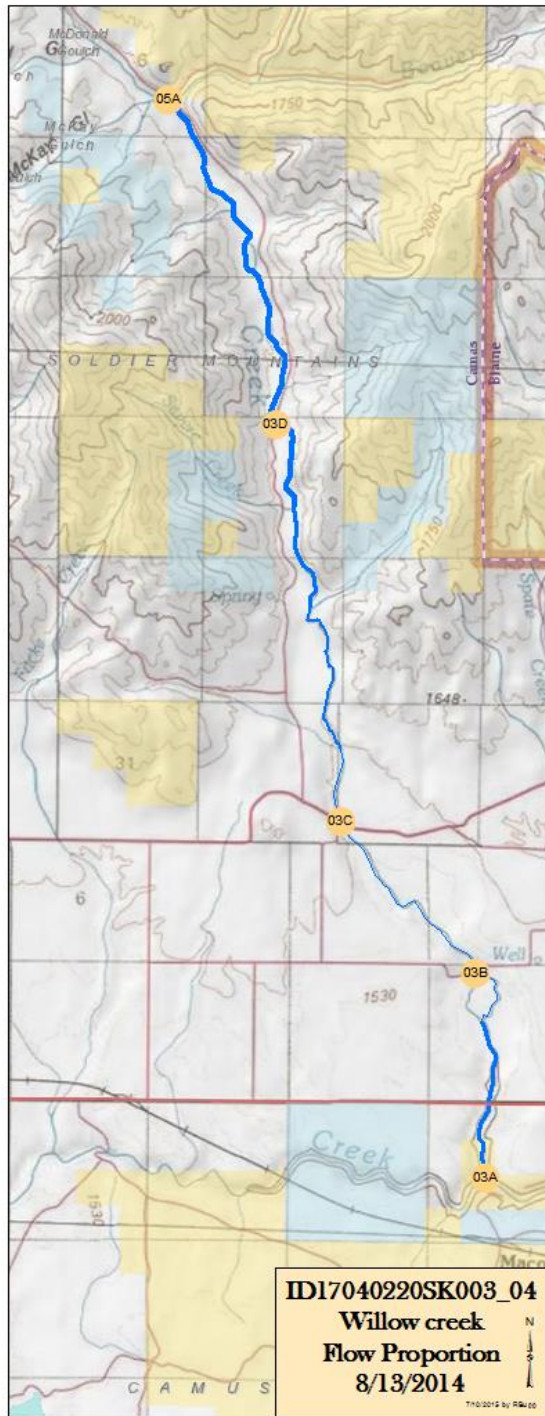


Figure 22. Proportional flow for assessment unit ID17040220SK003_04, 8/13/2014.

Past Conditions

The 2005 Camas TMDL found that temperature was the pollutant of concern in Willow Creek (DEQ 2005, pg. 170).

Current Conditions

DEQ sampled this water body from April 2014 through September 2014. These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 20).

Table 20. Willow Creek (US-3) water chemistry.

17040220-03A Willow Creek								
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	TP	TSS	E. coli	Flow	
	mg/L	mg/L	mg/L	mg/L		MPN/100 mL		
4/8/2014 ¹	0.043	0.46	2.8	0.32	370	98.7	27.15	
5/6/2014 ²	<0.010	0.43	0.93	0.51	150	26.2	23.00	
6/3/2014	<0.010	0.72	0.96	0.36	96	1,732.90	11.16	
7/8/2014	<0.010	2.5	0.4	0.058	<5.0	980.4	2.490	
8/13/2014 ³	<0.010	2.4	0.46	0.064	<5.0	866.4	1.967	
9/9/2014	<0.010	3.2	0.19	0.058	<5.0	274.7	1.430	
Field notes:								
1. Very fast and turbid flow. Spring runoff erosion from Beaver Complex fire area.								
2. Very turbid. Camas Creek upstream of Willow Creek confluence is mostly clear; majority of turbidity in Camas Creek downstream resulting from Willow Creek influence.								
3. Willow Creek is providing almost the entire flow of Camas Creek below this confluence. There is a small trickle upstream in Camas Creek - < 0.1 cfs.								

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-03A to represent discharge into downstream waters. To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 21). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 21. Willow Creek (US-3) nutrient summary.

17040220-03A Willow Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TN:TP Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	0.46	2.800	0.320	10.2	--	0.780
May	0.43	0.930	0.510	2.7	N Limited	1.054
June	0.72	0.960	0.360	4.7	N Limited	0.361
July	2.5	0.400	0.058	50.0	P Limited	0.013
August	2.4	0.460	0.064	44.7	P Limited	0.011
September	3.2	0.190	0.058	58.4	P Limited	0.007
¹ TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
² (TP [mg/L] *0.08982555)Flow [cfs] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-03A to represent TSS discharge into downstream waters (Table 22). This sample site is located on AU ID17040220SK003_04 immediately upstream from the confluence with Camas Creek. TSS specific to ID17040220SK003_02 was not assessed in 2014.

Table 22. Willow Creek (US-3) total suspended solids.

17040220-03A Willow Creek			
Total Suspended Solids			
Sample Date	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	370	27.15	164.68
May	150	23	56.56
June	96	11.16	17.56
July	<5.0	2.49	0.20
August	<5.0	1.967	0.16
September	<5.0	1.43	0.12
¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load			

The April sample yielded the highest TSS level for this AU. Visual observation indicated this was the result of soil and ash erosion in the Beaver Complex Fire footprint accelerated by spring snowmelt and is not likely to be representative of normal conditions. At flows in excess of 5 cfs, this sediment produced noticeable turbidity at the confluence with Camas Creek.

In 2011, a BURP assessment was performed for Willow Creek immediately upstream of Camas Creek. A review of the habitat data for site 2011STWFA018 shows total fines in excess of 40%, while streambank stabilities were less than 80% (Figure 23).

Streambank Conditions			
Left			
Covered and Stable	Covered and Unstable	Uncovered and Stable	Uncovered and Unstable
77.33%	0.00%	22.67%	0.00%
Right			
Covered and Stable	Covered and Unstable	Uncovered and Stable	Uncovered and Unstable
76.67%	6.67%	9.33%	7.33%
% Fines			
	Wet Fines/Wet Total	Dry Fines/Dry Total	All Fines/All Total
Silt/Sand (≤ 2.5 mm)	30.47%	80.56%	41.46%
Silt/Sand/VFP (≤ 6 mm)	36.72%	86.11%	47.56%

Figure 23. BURP assessment site 2011STWFA018 on ID17040220SK003_04 (Willow Creek).

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-03A are displayed in Table 23. Sample results from 17040220-03A indicate *E. coli* concentrations exceeded trigger values in June, July, and August 2014.

Table 23. Willow Creek (US-3) *E. coli*.

17040220-03A Willow Creek			
Bacteria			
Sample Date	<i>E.coli</i>	Flow	Trigger ¹
	MPN/100 mL	ft ³ /sec	
April	98.7	27.15	--
May	26.2	23	--
June	1732.9	11.16	PCR, SCR
July	980.4	2.49	PCR, SCR
August	866.4	1.967	PCR, SCR
September	274.7	1.43	--
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Temperature

A long-term thermograph is deployed in this water body to capture hourly water temperature measurements. The temperature plot for 9/01/2013–8/31/2014 is displayed in Figure 24. This plot displays that AU ID17040220SK003_04 had few exceedances of the numeric criteria of 22 °C for the CWAL beneficial use as defined in IDAPA 58.01.02.250.02.b.

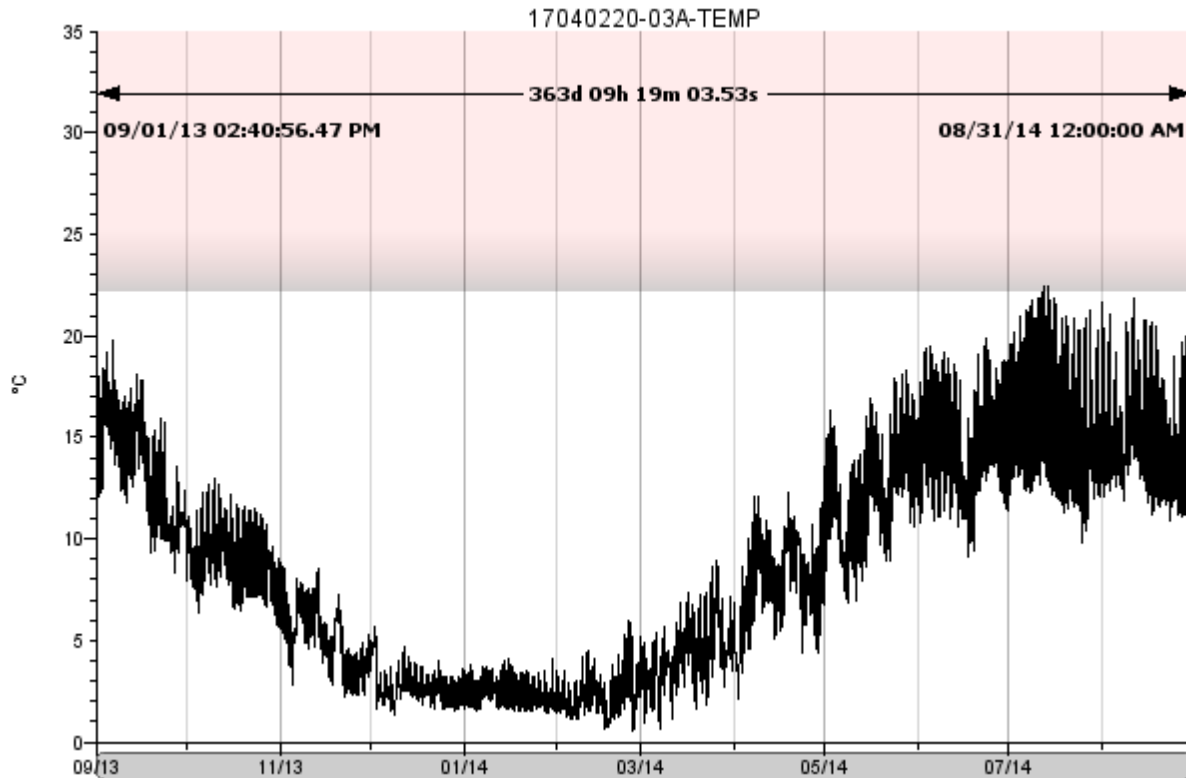


Figure 24. Willow Creek (US-3) thermograph.

2.4.3.3 TMDL Targets, Loads, and Status

The 2005 Camas TMDL set a pollutant load target for Willow Creek for temperature in one AU. Past load, current load, and current status are displayed in Table 24.

Table 24. Willow Creek (US-3) TMDL load summary and status.

AU	TMDL Pollutant	2005 Load	2014 Load	TMDL Target	Target Status
ID17040220SK003_02	— No TMDL —				
ID17040220SK003_04	Temperature Solar Load (kWh/day)	535,072 ^a	430,000 ^b	300,000 ^c	Target exceeded ^d
a. Load identified in the 2005 Camas TMDL pgs. 170–172. b. Load calculated from 2016 Camas PNV TMDL shade curves. c. Target prescribed in the 2016 Camas PNV TMDL. d. Target status determined as described in this section's narrative.					

Temperature TMDL

A temperature TMDL addendum was developed in 2016 using a PNV analysis to update the previous solar load estimate and target. The 2016 Camas PNV TMDL addendum set the individual segment shade targets and total solar load target of 300,000 kWh/day for AU SK003_04 (Table 25).

Table 25. Willow Creek (US-3) heat load summary.

US-3 Willow Creek PNV Temperature Loads ¹			
AU	Target	Existing	Excess
	kWh/day	kWh/day	kWh/day
003_04	300,000	430,000	130,000
¹ Solar loading from 2016 PNV Temperature TMDL.			

The existing shade for each segment was found to vary. Some segments meet or exceed the shade potential, and some segments are shade deficient. The calculated heat loading based upon existing shade is 430,000 kWh/day for SK003_04.

The thermograph plot for 17040220-03A (Figure 24) indicates that within this AU, water temperature meets criteria set for CWAL at 22 °C (IDAPA 58.01.02). An exceedance analysis of the temperature data from 9/1/2013 through 8/31/2014 yielded 0% exceedances.

Based on the 2016 PNV shade analysis for the temperature TMDL addendum and the thermograph data set from site 17040220-03A, the following conclusions are drawn for water temperature:

- AU ID17040220SK003_04 is exceeding the heat loading target prescribed in the 2016 Camas PNV TMDL addendum.
- AU ID17040220SK003_04 is meeting the water quality temperature criteria for CWAL beneficial use as defined in the Idaho water quality standards.

2.4.4 Beaver Creek (US-4)

For an overview of this WBID, see Figure 25.



Figure 25. WBID US-4, Beaver Creek – source to mouth.

2.4.4.1 Assessment Units

AU ID17040220SK004_02 includes the 1st- and 2nd-order tributaries contributing to the 3rd-order of Beaver Creek, totaling 14.14 miles. Segments are ephemeral, mostly exhibiting flows in direct response to snowmelt and precipitation events. Additional flows are likely to be from ground water gains.

AU ID17040220SK004_03 is the 3rd-order of Beaver Creek. This segment begins at the confluence of Beaver Creek and Little Beaver Creek and continues 0.73 miles to Camas Creek. This segment is ephemeral, as the surface flow ceases mid-summer. However, ponded water does remain in a few locations along this reach as a result of beaver pond complexes (Table 26).

Table 26. Beaver Creek (US-4) assessment units.

Idaho's 2012 Integrated Report			AU	Stream Segment
Category 4a: Impaired Waters with approved TMDLs			ID17040220SK004_02	Beaver Creek – source to mouth 14.14 miles
			ID17040220SK004_03	Source to mouth 0.73 miles
Beneficial Use	_02	_03	Causes	Reference
Cold water aquatic life	NS	NS	Water Temperature	ADB: Not identified TMDL (pgs. 172, 174): Lack of shade
Salmonid spawning	NS	FS	Water Temperature	ADB: Not identified TMDL (pg. 174): Lack of shade
Secondary contact recreation	FS	FS		
Agricultural water supply	NA	NA		
Industrial water supply	NA	NA		
Wildlife habitat	NA	NA		
Aesthetic	NA	NA		

Beneficial Use Comments**Cold Water Aquatic Life**

2004 BURP data indicate ALUS = not supporting.

Salmonid Spawning

Per WBAG II, Section 6.5, If ALUS = not fully supporting, then salmonid spawning is not fully supporting. 4/23/2012 (S. Woodhead) - Changed salmonid spawning to an existing use. Fish data from BURP sites 2001STWFA020 and 2001STWFA027 demonstrate evidence of salmonids less than 100mm (Idaho's WBAG II, page 3-9).

Secondary Contact Recreation

Based on GIS analysis, as per WBAG II, Section 7.3, recreation uses appear to be fully supporting.

AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	1993STWFA001	Beaver Creek	24.48	0.00	—	—	4.00	1.00	0.00
02	1995STWFB011	Beaver Creek	19.71	0.00	—	—	37.00	1.00	0.00
02	1997STWFA078	Beaver Creek	72.75	3.00	—	—	52.00	1.00	2.00
02	2001STWFA027	Beaver Creek	81.61	3.00	78.14	2.00	33.00	1.00	2.00
02	2011STWFA015	Beaver Creek	62.57	3.00	84.46	3.00	67.00	3.00	3.00
02	1993STWFA011	Little Beaver Ck	31.51	0.00	—	—	19.00	1.00	0.00
02	1995STWFB012	Little Beaver Ck	51.05	3.00	66.37	1.00	19.00	1.00	1.67
02	1997STWFA079	Little Beaver Ck	74.11	3.00	—	—	74.00	3.00	3.00

AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtnng	Score	Rtnng	Score	Rtnng	
02	2001STWFA027	Little Beaver Ck	87.51	3.00	72.47	2.00	56.00	2.00	2.33
02	2004STWFA001	Little Beaver Ck	58.36	2.00	—	—	36.00	1.00	1.50
02	2007STWFA104	Little Beaver Ck	—Dry ¹ —						
02	2011STWFA016	Little Beaver Ck	68.37	3.00	—	—	60.00	2.00	2.50
03	1997STWFA077	Beaver Creek	74.32	3.00	—	—	52.00	1.00	2.00
03	2014STWFA080	Beaver Creek	—Dry ² —						

2.4.4.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-4:

1. All stream segments comprising AU ID17040220SK004_02 are ephemeral.
2. ID17040220SK004_03 is ephemeral.
3. The improved road adjacent to Beaver Creek and Little Beaver Creek actively contributes to sediment loading via surface erosion and bank instability.
4. The 2013 Beaver Creek Complex Fire occurred partially within WBID US-4. Mass wasting and surface erosion originating within the burn scar is obvious.
5. Little Beaver Creek in ID17040220SK004_02 was experiencing debris flows and channel restructuring throughout spring and summer 2014.
6. The Princess Blue Ribbon Mine is within the drainage area of AU ID17040220SK004_02. Instream effects from historic operation of this mine are restricted to the road crossing culvert area and abandoned pond on Little Beaver Creek (Figure 26). Current conditions appear to be historically degraded but stable as a result of active beaver ponding.
7. Approximately 95% of AU ID17040220SK004_03 (0.73 miles) is involved in an active beaver pond complex.



Figure 26. Mine-road crossing of Little Beaver Creek.

Flow

Flows were collected for Beaver Creek at sampling location 17040220-04A, 50 meters upstream of the confluence with Willow Creek. April and May provided the only measurements of significant discharge at 3.93 cfs and 2.00 cfs, respectively. Subsequent measurements in June and July required the use of a small portable V-notch flume to determine trace flows of 0.59 and 0.02 cfs (Figure 27). This sampling location was dry in August and September.

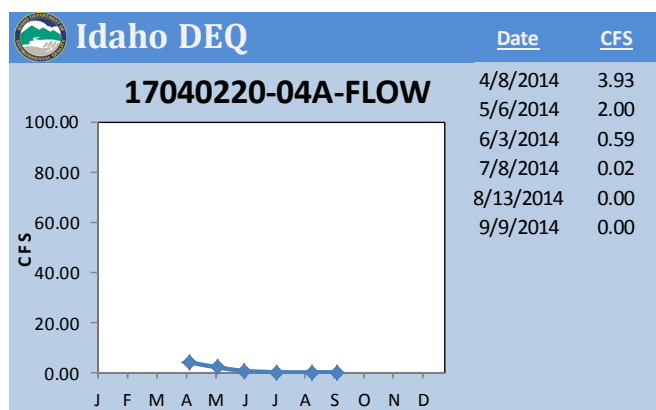


Figure 27. Flows at 17040220-04A, 2014.

Past Conditions

The 2005 Camas TMDL states that temperature is the pollutant of concern for Beaver Creek and Little Beaver Creek (DEQ 2005, pgs. 172 and 174).

Current Conditions

DEQ sampled this water body from April 2014 and through September 2014 (Figure 28). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 27).



Figure 28. Sample site 17040220-04A, 6/03/2014 and 9/17/2014.

Table 27. Beaver Creek (US-4) water chemistry.

17040220-04A Beaver Creek										
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	TP		TSS		E. coli		Flow
	mg/L	mg/L	mg/L	mg/L		mg/L		MPN/100 mL		ft³/sec
4/8/2014	0.033	0.15	0.94	0.22		51		2.0		3.929
5/6/2014	0.011	0.049	0.68	0.18		23		5.2		1.997
6/3/2014	0.017	0.027	0.88	0.26		41		19.9		0.587
7/8/2014	0.13	0.072	1.1	0.19		20		19.7		0.018
8/13/2014	—	—	—	—		—		—		dry
9/9/2014	—	—	—	—		—		—		dry

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-04A to represent nutrient discharge into downstream waters. This sample site is located on AU ID17040220SK004_03 immediately upstream from the confluence with Willow Creek. Nutrients specific to AU ID17040220SK004_02 were not reviewed in 2014.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 28). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 28. Beaver Creek (US-4) nutrient summary.

17040220-04A Beaver Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TN:TP Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	0.15	0.940	0.220	5.0	N Limiting	0.078
May	0.049	0.680	0.180	4.1	N Limiting	0.032
June	0.027	0.880	0.260	3.5	N Limiting	0.014
July	0.072	1.100	0.190	6.2	N Limiting	0.000
August	--	--	--	--	--	--
September	--	--	--	--	--	--
¹ TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
² (TP [mg/L] *0.08982555)Flow [cfs] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-04A to represent TSS discharge into downstream waters (Table 29). This sample site is located on AU ID17040220SK004_03 approximately 50 meters upstream from the confluence with Willow Creek. TSS specific to ID17040220SK004_02 was not assessed in 2014.

Table 29. Beaver Creek (US-4) total suspended solids.

17040220-04A Beaver Creek			
Total Suspended Solids			
Sample Date	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	51	3.929	3.28
May	23	1.997	0.75
June	41	0.587	0.39
July	20	0.018	0.01
August	--	dry	--
September	--	dry	--
¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]			

The April sample yielded the highest TSS level for this water body. Visual observation indicated that this was the result of soil and ash erosion in the Beaver Complex Fire footprint accelerated by spring snowmelt and is not likely to be representative of normal conditions.

A BURP assessment was attempted for ID17040220SK004_03 in 2014. Evidence of post-fire mass wasting as a contributor to sedimentation is identified in the notes for BURP site 2014STWFA080:

Stream was dry with some small amount of standing water from rainstorm. Rabbit brush, willows, reeds, sagebrush, wild rose, beaver activity, and ungulate trac[k]s found. Vegetation was gre[e]n, thus likely had flow earlier in season. Road closed due to blowout from recent storm.

Walking bank stability inventories were performed for this water body in May 2014 (Figure 29). Problematic areas were identified on Little Beaver Creek, apparently a direct result of post-fire mass wasting events.

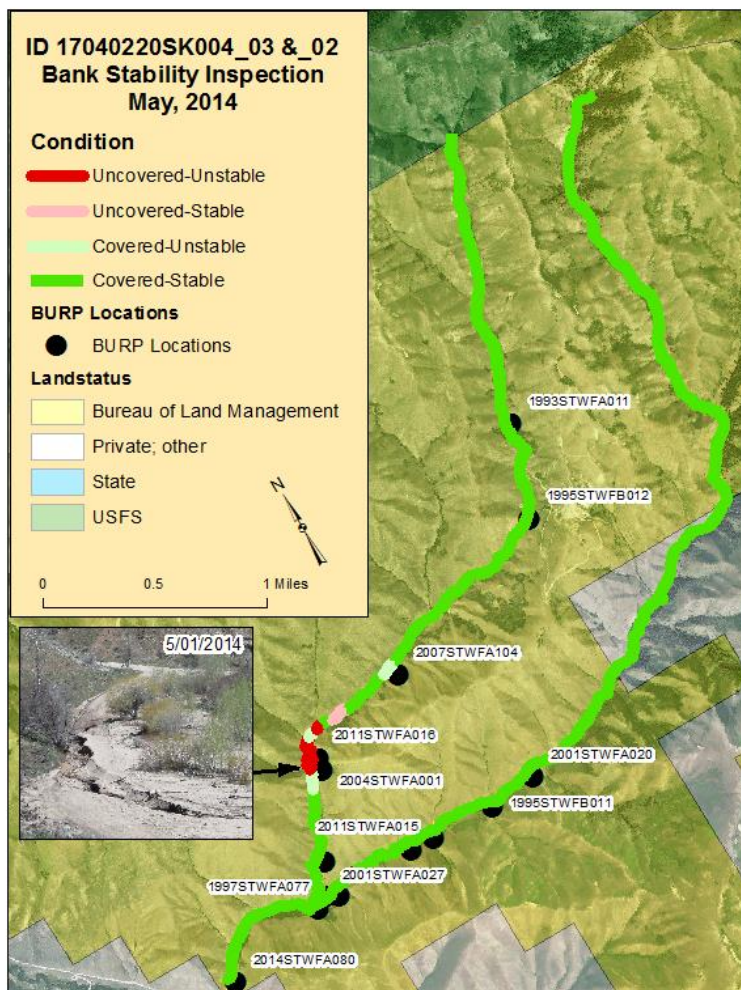


Figure 29. Beaver Creek (US-4) bank stability inventory.

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-04A are displayed in Table 30 and do not indicate any *E. coli* concentrations above trigger values.

Table 30. Beaver Creek (US-4) *E. coli*.

17040220-04A Beaver Creek Bacteria			
Sample Date	<i>E.coli</i>	Flow	Trigger¹
	MPN/100 mL	ft ³ /sec	
April	2.0	3.93	--
May	5.2	1.997	--
June	19.9	0.587	--
July	19.7	0.018	--
August	--	dry	--
September	--	dry	--

¹ > 406cfu/100ml for Primary Contact Recreation > 576
cfu/100ml for Secondary Contact Recreation

Temperature

A thermograph was deployed in this water body to capture hourly water temperature measurements. The temperature plot for 4/11/2014–9/15/2014 is displayed in Figure 30. The plot indicates that AU ID17040220SK004_03 has zero exceedances of the instantaneous numeric criteria of 22 °C for the CWAL beneficial use as defined in IDAPA 58.01.02.250.02.b during the measurement period. However, many instantaneous exceedances were seen for the salmonid spawning (SS) beneficial use criteria of 13 °C. Analysis of this temperature data set also identified average criteria exceedances for SS. However, ephemeral flow conditions at the thermograph are likely to have contributed to some of the exceedances. The exceedance analysis summary is provide in Table 31.

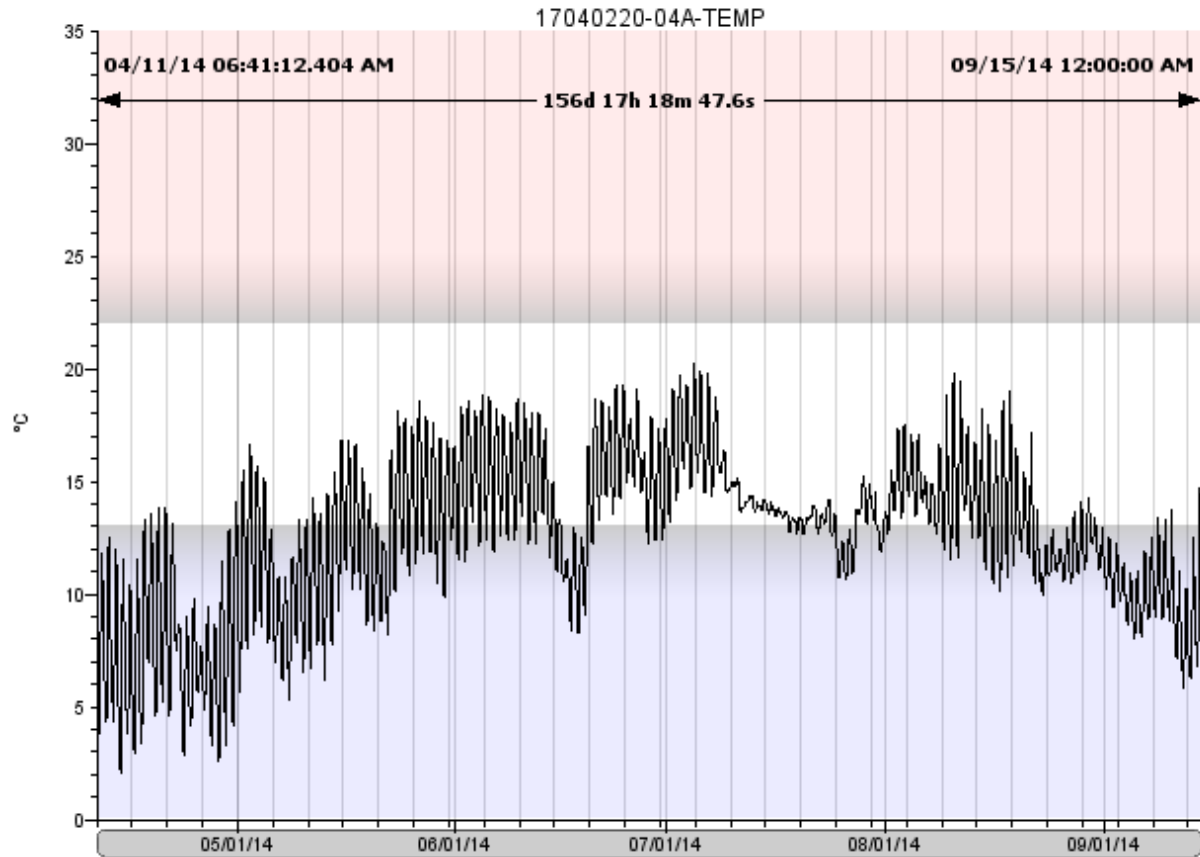


Figure 30. Beaver Creek (US-4) thermograph.

Table 31. Exceedances for site 17040220-04A, 4/11/2014–9/15/2014.

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	85	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prcnt	
13 °C Instantaneous Spring	74	80%	
9 °C Average Spring	77	84%	
Spring Days Eval'd w/in Dates	92	15-Apr	15-Jul
13 °C Instantaneous Fall	0	0%	
9 °C Average Fall	0	0%	
Fall Days Eval'd w/in Dates	0	15-Sep	15-Nov
13 °C Instantaneous Total *	74	80%	
9 °C Average Total *	77	84%	
Tot Days Eval'd w/in Both Dates *	92		

2.4.4.3 TMDL Targets, Loads, and Status

The 2005 Camas TMDL set heat load targets for Beaver Creek and Little Beaver Creek. The heat load specific to AUs SK004_02 and SK004_03 were not calculated. Past load, current load, and current status are displayed in Table 32.

Table 32. Beaver Creek (US-4) TMDL load summary and status.

AU	TMDL Pollutant	2005 Load	2014 Load ^b	TMDL Target ^c	Target Status ^d
ID17040220SK004_02	Temperature Solar Load (kWh/day)	32,598 ^a	79,000	56,000	Target exceeded
ID17040220SK004_03	Temperature Solar Load (kWh/day)	74,828	19,000	17,000	Target exceeded
a. Load identified in the 2005 Camas TMDL pgs. 174–175; Little Beaver Creek only. b. Load calculated from 2016 Camas PNV TMDL shade curves. c. Target prescribed in the 2016 Camas PNV TMDL. d. Target status determined as described in this section's narrative.					

Temperature TMDL

A PNV analysis was completed for this water body in 2016 to re-evaluate segment shade targets and heat loading. Total solar load targets were set at 56,000 kWh/day for AU SK004_02 and 17,000 kWh/day for AU SK004_03 (Table 33).

Table 33. Beaver Creek (US-4) heat load summary.

US-4 Beaver Creek PNV Temperature Loads ¹			
AU	Target kWh/day	Existing kWh/day	Excess kWh/day
004_02	56,000	79,000	23,000
004_03	17,000	19,000	2,000
¹ Solar loading from 2016 PNV Temperature TMDL.			

The existing shade for each segment was found to vary. Some segments meet or exceed the shade potential, and some segments are shade deficient. The calculated existing heat loads based on existing shade are 79,000 kWh/day for SK004_02 and 19,000 kWh/day for SK004_03.

Based on the 2016 PNV shade analysis for the temperature TMDL addendum and the thermograph data set from site 17040220-04A, the following conclusions are drawn for water temperature:

- AU ID17040220SK004_02 is exceeding the heat loading target prescribed in the 2016 Camas PNV TMDL addendum.
- AU ID17040220SK004_03 is exceeding the heat loading target prescribed in the 2016 Camas PNV TMDL addendum. Additionally, this AU appears to be meeting the temperature criteria for CWAL beneficial use and exceeding the temperature criteria for SS. However, exceedance data in this AU may not be accurate due to ephemeral flows.

2.4.5 Willow Creek (US-5)

For an overview of this WBID, see Figure 31.

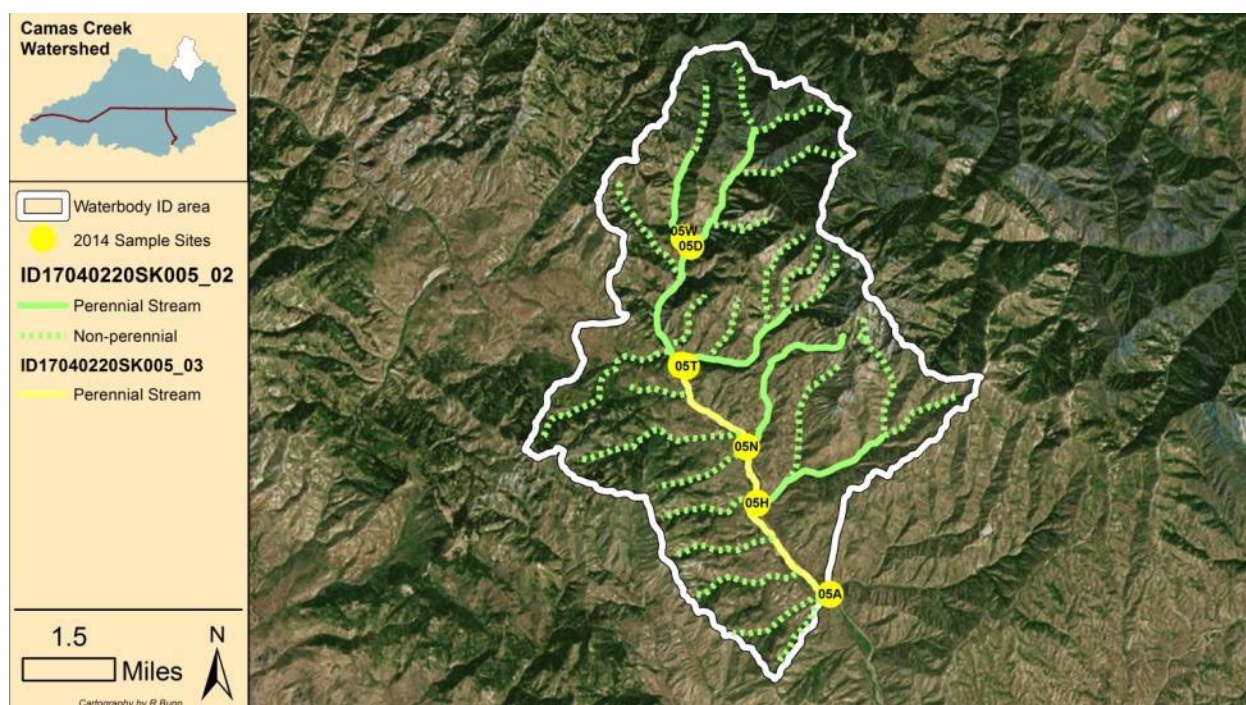


Figure 31. WBID US-5, Willow Creek – source to Beaver Creek.

2.4.5.1 Assessment Units

AU ID17040220SK005_02 includes the 1st- and 2nd-order tributaries contributing to the 3rd-order of Willow Creek, totaling 53.17 miles. Most tributaries in this AU are ephemeral, exhibiting flows in direct response to snowmelt and precipitation events. A few 2nd-order streams are perennial: Cherry Creek, Nebraska Creek, Buttercup Creek, West Fork Willow Creek, and Willow Creek.

AU ID17040220SK005_03 is the 3rd-order of Willow Creek. This segment begins at the confluence of Willow Creek and Buttercup Creek and continues 4.84 miles to Beaver Creek. This segment is perennial (Table 34).

Table 34. Willow Creek (US-5) assessment units.

Idaho's 2012 Integrated Report				AU			Stream Segment		
Category 2: Full Support				ID17040220SK005_02			Willow Creek – source to Beaver Creek 53.17 MILES		
				ID17040220SK005_03			source to Beaver Creek 4.84 MILES		
Beneficial Use		_02	_03	Causes			Reference		
Cold water aquatic life		FS	FS						
Salmonid spawning		FS	FS						
Primary contact recreation		FS	FS						
Secondary contact recreation		FS	NA						
Agricultural water supply		NA	NA						
Industrial water supply		NA	NA						
Wildlife habitat		NA	NA						
Aesthetic		NA	NA						
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	1993STWFA004	Cherry Creek	—Dry—						
02	1995STWFA041	Cherry Creek	53.38	3.00	—	—	81.00	3.00	3.00
02	1995STWFA052	Buttercup Creek	43.04	2.00	—	—	62.00	3.00	2.50
02	2001STWFA009	West Fork Willow Creek	84.88	3.00	82.87	3.00	85.00	3.00	3.00
02	2001STWFA011	Wine Creek	—Dry—						
02	2001STWFA012	Buttercup Creek	89.87	3.00	95.00	3.00	50.00	1.00	2.33
02	2001STWFA021	Cherry Creek	75.95	3.00	79.17	2.00	44.00	1.00	2.00
02	2004STWFA003	Willow Creek	78.03	3.00	61.69	1.00	61.00	2.00	2.00
02	2005STWFA013	Willow Creek	57.38	2.00	94.18	3.00	53.00	1.00	2.00
02	2011STWFA020	Willow Creek	77.02	3.00	83.33	3.00	59.00	2.00	2.67
02	2012STWFA056	Buttercup Creek	92.51	3.00	98.63	3.00	37.00	1.00	2.33
02	2014STWFA079	Cherry Creek	—Dry—						
03	2001STWFA013	Willow Creek	95.97	3.00	74.58	2.00	69.00	3.00	2.67
03	2011STWFA021	Willow Creek	78.00	3.00	85.06	3.00	50.00	1.00	2.33

2.4.5.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-5:

1. The gradient of the 1st- and 2nd-order tributaries contributes to erosional stream characteristics, while the gradient of the 3rd-order channel promotes depositional characteristics.
2. ID17040220SK005_03 has active beaver complexes at several locations.
3. The 2013 Beaver Creek Complex Fire occurred partially within WBID US-5. Mass wasting and surface erosion originating within the burn scar is obvious in Cherry Creek, Nebraska Creek, Buttercup Creek, and the 2nd-order of Willow Creek.
4. Erosion and sedimentation resulting from the Beaver Complex Fire is evident throughout WBID US-5.

Flow

Flows were collected for Willow Creek at sampling location 17040220-05A, 50 meters upstream of the confluence with Beaver Creek. April, May, and June provided the most significant discharges, each measurement exceeding 10 cfs. Regular flows in subsequent months appear to be less than 2 cfs. The flow bump measured in August (2.73 cfs) was in direct response to heavy rainfall (Figure 32).

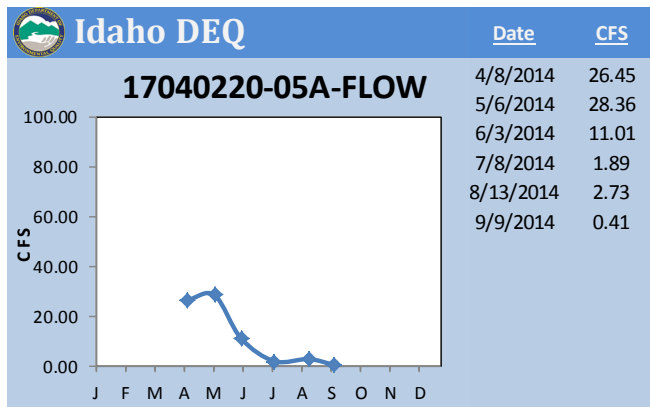


Figure 32. Flows at 17040220-05A, 2014.

Past Conditions

The 2005 Camas TMDL did not specifically discuss the portions of Willow Creek comprising AU ID17040220SK005_02 or ID17040220SK005_03. The subbasin assessment identifies primary water quality influences for upper and middle Willow Creek as recreation, roads, grazing, agriculture, and diversion.

Following a complaint received in 2012, DEQ investigated conditions in Nebraska and Buttercup Creeks. Visual inspection suggested that streambank stability was compromised as a result of recent livestock grazing. Subsequently, Wolman pebble counts were performed at the critical areas to provide some background information regarding sedimentation and for comparison with

other streams in the basin. The US Forest Service was notified to identify and communicate the potential impairments resulting from this authorized action.

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 33). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 35).



Figure 33. Sample site 17040220-05A, 4/08/2014 and 7/08/2014.

Table 35. Willow Creek (US-5) water chemistry.

17040220-05A Willow Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TSS	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100mL	ft ³ /sec
4/8/2014	0.10	0.35	7.6	4.2	1800	44.8	26.45
5/6/2014 ¹	0.023	0.24	1.5	2.0	580	13.1	28.36
6/3/2014	<0.010	0.18	0.55	0.41	110	29.2	11.01
7/8/2014	<0.010	0.016	0.29	0.17	12	290.9	1.886
8/13/2014 ²	0.046	0.15	1.4	0.90	270	332.8	2.732
9/9/2014	<0.010	<0.010	0.46	0.18	18	127.3	0.410
Field notes:							
1. Very turbid. Appears to be ash/sediment from Beaver Complex fire.							
2. Very turbid. Bank deposition indicates sediment from burn scar.							

A stratified sampling effort for this WBID occurred on 8/13/2014 (Table 36). Three Willow Creek sites and four tributary sites were sampled on the same date to provide a watershed-wide view of conditions. Recent precipitation and subsequent erosion and debris flows in the Beaver Complex burn scar likely influenced most of the high concentrations found during this effort.

Table 36. Willow Creek (US-5) stratified sampling results, 8/13/14.

17040220-05 Willow Creek							
Sample Site 8/13/2014	NH³	NO_x	TKN	TP	TSS	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L		MPN/ 100mL	cfs
(D) Willow	0.041	0.160	1.20	1.90	490	48.7	1.293
(W) WF Willow ¹	0.019	0.150	0.23	0.16	10	>2,419.6	0.154
(C) Willow ²	0.062	0.140	1.80	2.80	800	1152.8	1.638
(T) Buttercup ³	0.092	0.280	1.40	1.00	280	93.2	0.316
(N) Nebraska ⁴	0.032	0.170	0.89	0.79	100	209.8	0.059
(H) Cherry ⁵	<0.010	0.065	0.29	0.12	24	235.9	0.071
(A) Willow ⁶	0.046	0.150	1.40	0.90	270	332.8	2.732

1. Water is clear.

2. Large amounts of gruss moving. Gruss is defined as a rock-type that is finely granulated but not decomposed by weathering.

3. Large amounts of gruss moving.

4. Gruss actively moving in stream.

5. Water is clear. Some floating debris is present - twigs, leaves, etc.

6. Very turbid. Bank deposition indicates probable sediment from Beaver Complex burn scar.

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-05A to represent nutrient discharge into downstream waters. This sample site is located on AU ID17040220SK005_03 immediately upstream from the confluence with Beaver Creek. Nutrients specific to ID17040220SK005_02 were not assessed every month during 2014. However, a stratified sampling effort did occur in August to aid in describing individual stream contributions (see above).

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 37). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 37. Willow Creek (US-5) nutrient summary.

17040220-05A Willow Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TP:TN Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	7.600	4.200	4.200	2.8	N Limited	9.979
May	1.500	2.000	2.000	1.8	N Limited	5.095
June	0.550	0.410	0.410	2.3	N Limited	0.405
July	0.290	0.170	0.170	2.7	N Limited	0.029
August	1.400	0.900	0.900	2.6	N Limited	0.221
September	0.460	0.180	0.180	3.6	N Limited	0.007

¹ TP:TN ratios -- Values > 16 = P Limiting Values < 10 = N Limiting

² (TP [mg/l] * 0.08982555)Flow [ft³/sec] = TP load [lbs/day]

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-05A to represent TSS discharge into downstream waters. This sample site is located on AU ID17040220SK005_03 approximately 50 meters upstream from the confluence with Beaver Creek. TSS specific to ID17040220SK005_02 was not assessed monthly in 2014.

The April sample yielded the highest TSS level for this water body (Table 38). Visual observation indicated that this was the result of soil and ash erosion in the Beaver Complex Fire footprint accelerated by spring snowmelt. It is not likely to be representative of the water body under more normal conditions.

Table 38. Willow Creek (US-5) total suspended solids.

17040220-05A Willow Creek			
Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	1800	26.45	780.48
May	580	28.36	269.65
June	110	11.01	19.85
July	12	1.886	0.37
August	270	2.732	12.1
September	18	0.41	0.1

¹ (TSS [mg/L] * 0.016393163)Flow [cfs] = TSS load [tons/year]

A bank stability inspection was performed for this water body in May 2014 (Figure 34). Very few vulnerable areas were identified on Willow Creek. The covered-unstable reach just upstream of Cherry Creek appeared to be a result of beaver dam failure, and the areas upstream of West Fork Willow Creek are experiencing deposition from the Beaver Complex Fire.

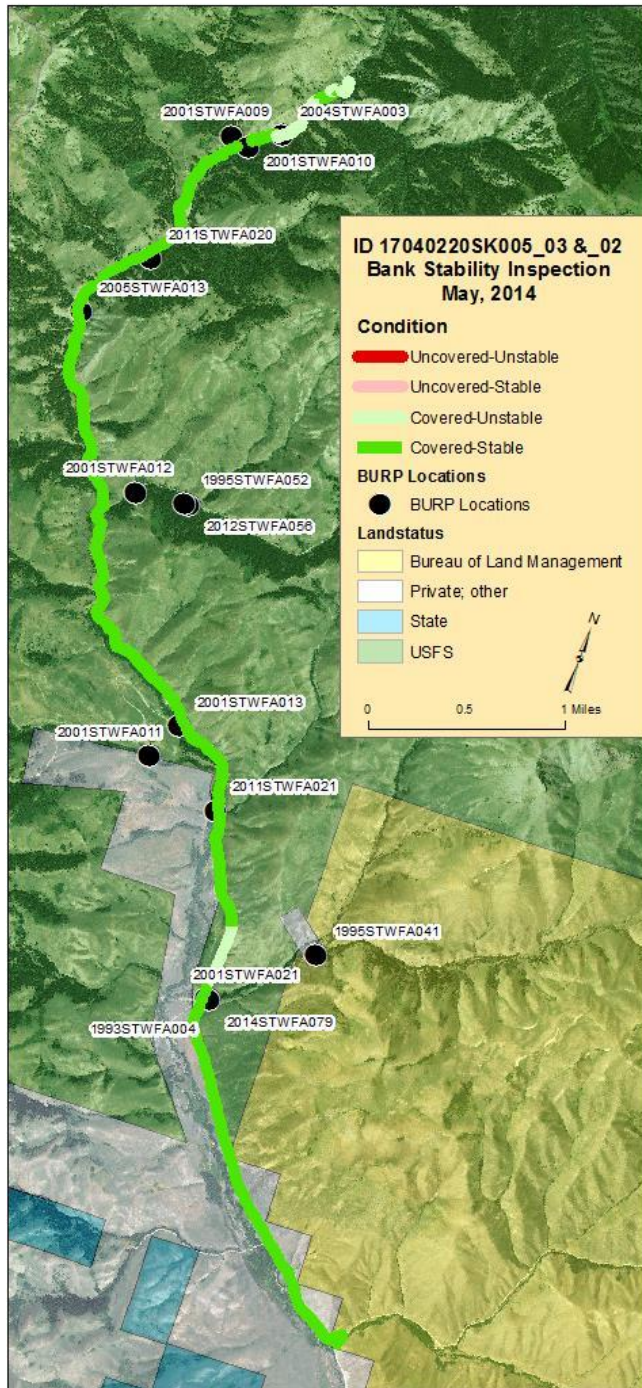


Figure 34. Willow Creek (US-5) bank stability inspection.

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-05A are displayed in Table 39 and do not indicate any *E. coli* concentrations above trigger values.

Table 39. Willow Creek (US-5) *E. coli*.

17040220-05A Willow Creek			
Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/100mL	ft ³ /sec	
April	44.8	26.45	--
May	13.1	28.36	--
June	29.2	11.01	--
July	290.9	1.886	--
August	332.8	2.732	--
September	127.3	0.41	--

¹ > 406cfu/100ml for Primary Contact Recreation >
576 cfu/100ml for Secondary Contact Recreation

Temperature

A thermograph was deployed in this water body to capture hourly water temperature measurements. The temperature plot for 4/11/2014–9/15/2014 is displayed in Figure 35. Analysis of this temperature data set identified average criteria exceedances for CWAL and SS. The exceedance analysis summary is provided in Table 40, and the complete exceedance analysis is included Appendix A.

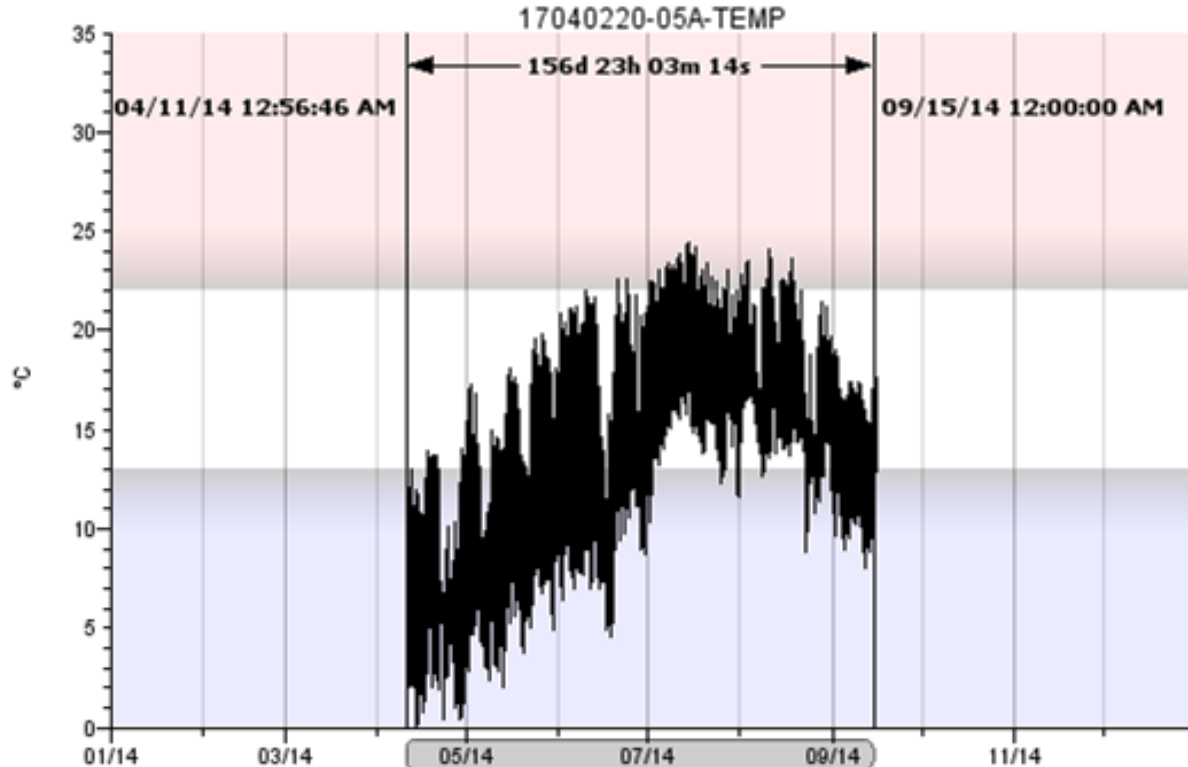
**Figure 35. Willow Creek (US-5) thermograph.**

Table 40. Exceedances for site 17040220-05A, 4/11/2014–9/15/2014.

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prcnt	
22 °C Instantaneous	37	44%	
19 °C Average	10	12%	
Days Evaluated & Date Range	85	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prcnt	
13 °C Instantaneous Spring	77	84%	
9 °C Average Spring	65	71%	
Spring Days Eval'd w/in Dates	92	15-Apr	15-Jul
13 °C Instantaneous Fall	0	0%	
9 °C Average Fall	0	0%	
Fall Days Eval'd w/in Dates	0	15-Sep	15-Nov
13 °C Instantaneous Total *	77	84%	
9 °C Average Total *	65	71%	
Tot Days Eval'd w/in Both Dates	92		

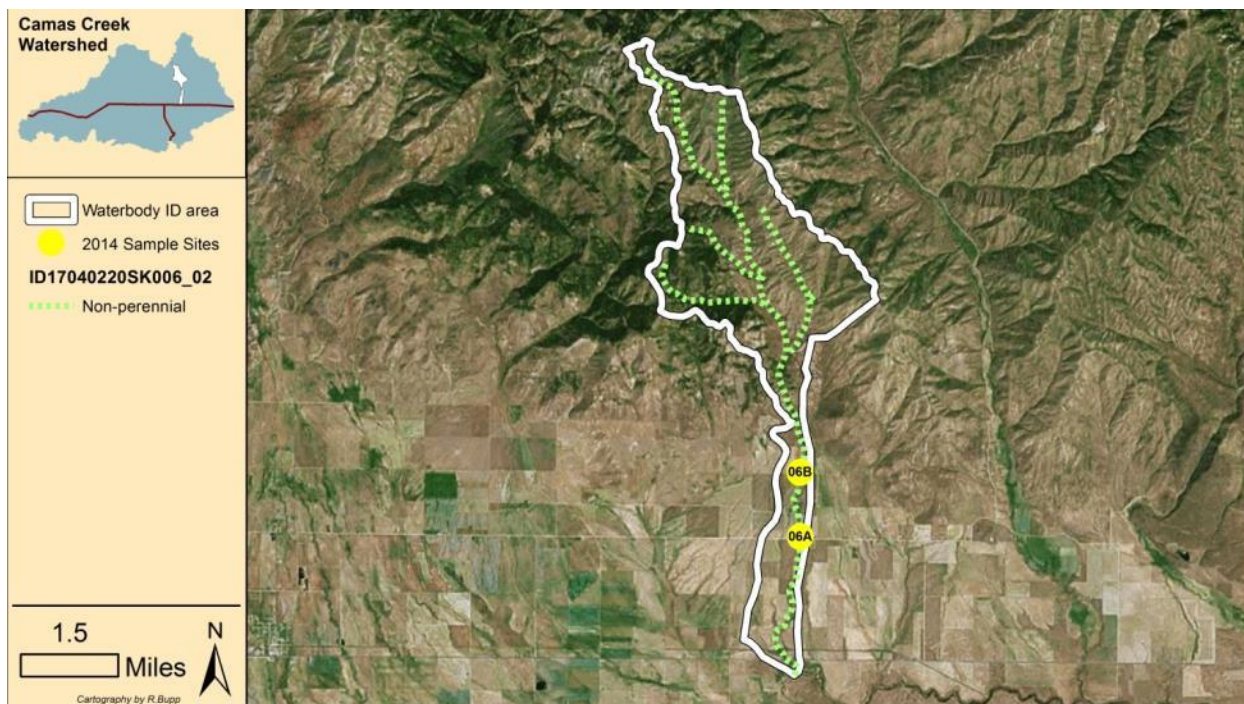
* If spring & fall dates overlap double counting may occur

2.4.5.3 TMDL Targets, Loads, and Status

No TMDLs were developed for the AUs in this water body.

2.4.6 Elk Creek (US-6)

For an overview of this WBID, see Figure 36.

**Figure 36. WBID US-6, Elk Creek – source to mouth.**

2.4.6.1 Assessment Units

AU ID17040220SK006_02 includes the 1st- and 2nd-order tributaries that contribute to the 5th-order of Camas Creek (AU ID17040220SK007_05), for a total of 18.46 miles. All segments are ephemeral, exhibiting flows in direct response to snowmelt and precipitation events (Table 41).

Table 41. Elk Creek (US-6) assessment unit.

Idaho's 2012 Integrated Report		AU	Stream Segment
Category 4a: Impaired Waters with approved TMDLs		ID17040220SK006_02	Elk Creek – source to mouth 18.46 MILES
Beneficial Use	_02	Causes	Reference
Cold water aquatic life	NS	Sedimentation/Siltation	ADB: Assessment 11/15/2004 TMDL (pg. 180): Streambank erosion
Secondary contact recreation	NA		
Agricultural water supply	NA		
Industrial water supply	NA		
Wildlife habitat	NA		
Aesthetic	NA		

AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	1993STWFA010	Elk Creek	17.17	0.00	—	—	12.00	1.00	0.00
02	2001STWFA039	Elk Creek					—Dry—		
02	2014STWFA036	Elk Creek					—Dry—		

2.4.6.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 for WBID US-6 were as follows:

1. All stream segments comprising AU ID17040220SK006_02 are ephemeral.
2. Diversion for irrigation occurs immediately downstream of the BLM property near the mouth of the canyon. Diversion commences in May and continues until supplying flow depletes.
3. Diversion occurs in a reach with an active beaver community, with ponds mostly remaining as intact as possible.
4. The walking streambank stability inventory identified historic channel incision upstream of the BLM land. This appears to have mostly stabilized. Existing features observed include point bars, re-established flood plain, and well-rooted willow communities (Figure 37).



Figure 37. Elk Creek, recovering channel.

Flow

Flows were collected for Elk Creek at sampling location 17040220-06B, at the northern boundary of the Geran property. April and May provided the only measurements of significant discharge at 2.54 cfs and 2.88 cfs, respectively. Subsequent measurement in June required the use of a small portable V-notch flume to determine the flow of 0.15 cfs. This sampling location was dry in July, August, and September (Figure 38).

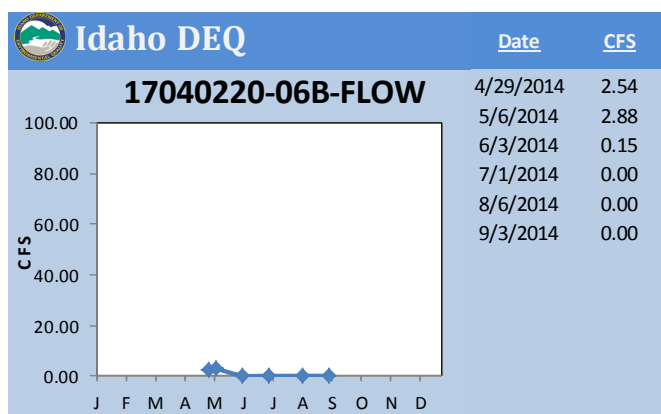


Figure 38. Flows at 17040220-06B, 2014.

Past Conditions

The 2005 Camas TMDL found that sediment is the pollutant of concern for Elk Creek and that lack of flow is the largest impact to beneficial uses (DEQ 2005, pg. 180).

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 39). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 42).



Figure 39. Sample site 17040220-06B, 6/03/2014 and 8/06/2014.

Table 42. Elk Creek (US-6) water chemistry.

17040220-06A Elk Creek								
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TSS	E. coli	Flow	
	mg/L	mg/L	mg/L	mg/L		MPN/100 mL		
4/9/2014	<0.010	<0.010	0.25	0.036	<5.0	62.7	2.915	
17040220-06B Elk Creek								
4/29/2014	—	—	—	—	—	—	2.540	
5/6/2014	<0.010	<0.010	0.28	0.032	<5.0	12.1	2.878	
6/3/2014	<0.010	<0.010	0.20	0.044	<5.0	48.0	0.152	
7/1/2014	—	—	—	—	—	—	dry	
8/6/2014	—	—	—	—	—	—	dry	
9/3/2014	—	—	—	—	—	—	dry	

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-06A in April then at 17040220-06B for subsequent months. These locations represent nutrient discharge into downstream waters and are located on AU ID17040220SK006_02 at Baseline Road (06A) and the northern boundary of the Geran property (06B).

To describe nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 43). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 43. Elk Creek (US-6) nutrient summary.

17040220-06B Elk Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TP:TN Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April (6A)	<0.010	0.250	0.036	7.2	N Limited	0.009
May	<0.010	<0.010	0.032	0.6	N Limited	0.008
June	<0.010	<0.010	0.044	0.5	N Limited	0.001
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--
¹ TP:TN ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
² (TP [mg/l] *0.08982555)Flow [ft3/sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-06A in April, then at 17040220-06B for subsequent months.

The samples analyzed for TSS display low sediment levels for this water body, which supports the narrative provided in the TMDL suggesting that erosion occurs when the critical flow of 5 cfs is exceeded (Table 44). This critical flow was not exceeded during the sampling period.

Table 44. Elk Creek (US-6) total suspended solids.

17040220-06B Elk Creek			
Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April (6A)	<5.0	2.915	0.24
May	<5.0	2.878	0.24
June	<5.0	0.152	0.01
July	--	dry	--
August	--	dry	--
September	--	dry	--
¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]			

A bank stability inspection was performed for this water body in June 2014 (Figure 40). Two vulnerable areas were identified on Elk Creek as uncovered-stable. These two segments are incised with no canopy cover, likely as a result of historic grazing impacts causing channel down cutting, followed by a recession of the water table. Currently, sagebrush and upland plants are

adjacent to the stable banks but no vegetation has re-established in the channel bottom or on the banks.

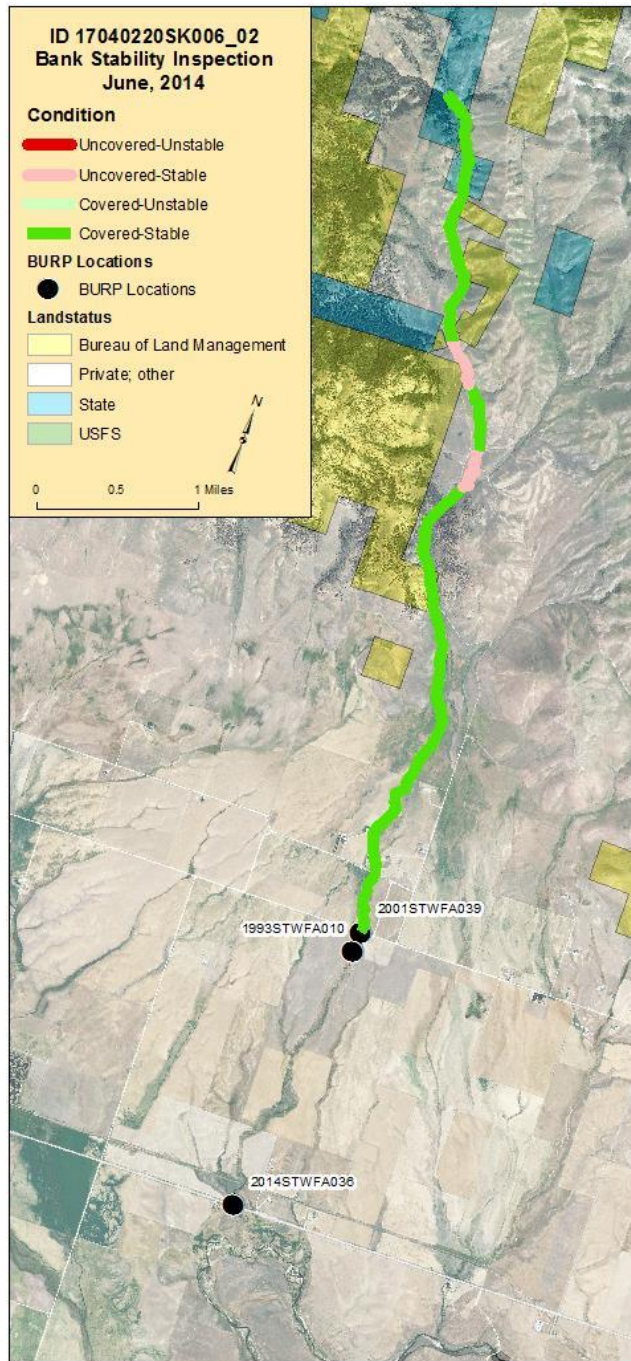


Figure 40. Elk Creek (US-6) bank stability inspection.

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-06B are displayed in Table 45 and do not indicate any *E. coli* concentrations above trigger values.

Table 45. Elk Creek (US-6) *E. coli*.

17040220-06B Elk Creek			
Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/100 mL	ft ³ /sec	
April (6A)	62.7	2.92	--
May	12.1	2.878	--
June	48.0	0.152	--
July	--	dry	--
August	--	dry	--
September	--	dry	--
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Temperature

A thermograph was deployed in this water body to capture hourly water temperature measurements. The temperature plot for 4/30/2014–6/16/2014 is displayed in Figure 41. The plot indicates that AU ID17040220SK006_02 has a few exceedances of the instantaneous numeric criteria of 22 °C for the CWAL beneficial use as defined in IDAPA 58.01.02.250.02.b during the measurement period. An exceedance analysis of this temperature data set revealed 5 days with instantaneous exceedances, but 0 days exceeded the 19 °C average criteria for CWAL. The exceedance analysis summary is provided in Table 46.

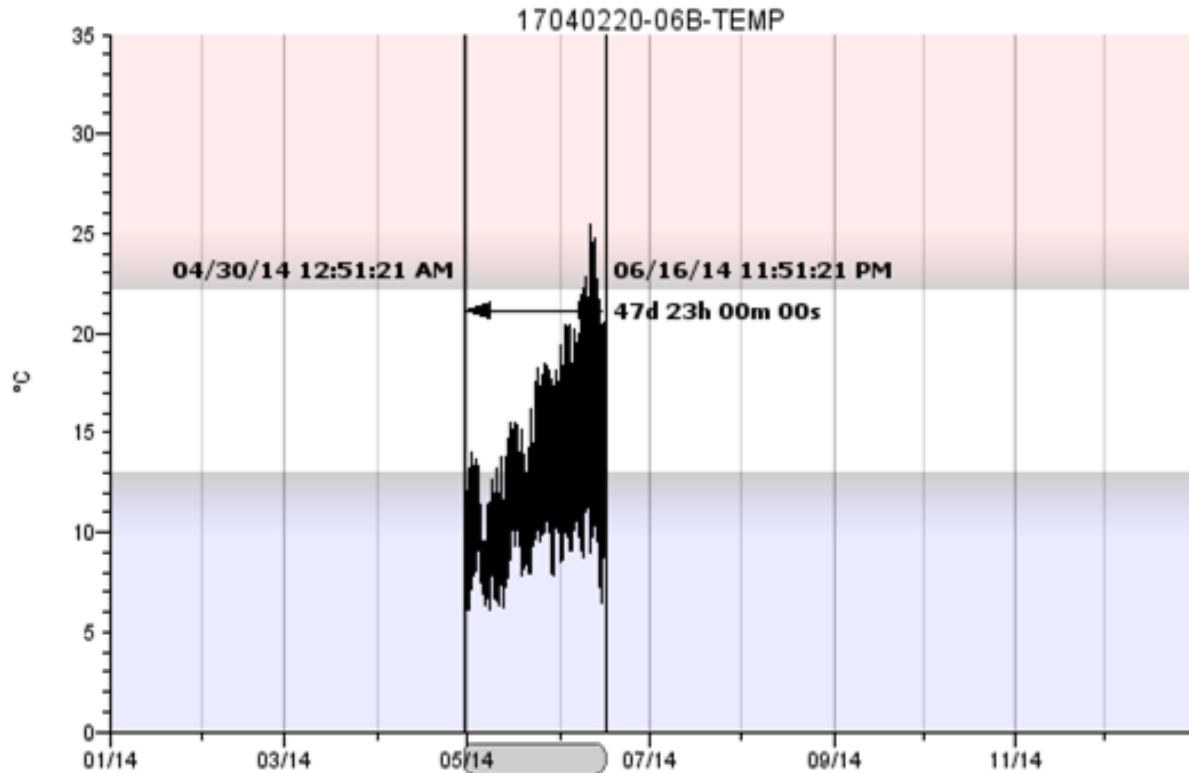


Figure 41. Elk Creek (US-6) thermograph.

Table 46. Exceedances for site 17040220-06B, 4/30/2014–6/16/2014.

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prct	
22 °C Instantaneous	5	10%	
19 °C Average	0	0%	
Days Evaluated & Date Range	48	1-Apr	21-Sep

A complete exceedance analysis is in Appendix A.

2.4.6.3 TMDL Targets, Loads, and Status

The 2005 Camas TMDL set a load target for sediment for this water body. Past load, current load, and current status are displayed in Table 47.

Table 47. Elk Creek (US-6) TMDL load summary and status.

AU	TMDL Pollutant	2005 Load	2014 Load ^b	TMDL Target ^c	Target Status ^d
ID17040220SK006_02	Sediment (t/yr)	142.1 ^a	0.24 ^b	Load capacity 63.6 t/yr	Target achieved.
				80% bank stability	Target achieved
<div>a. Existing load identified in the 2005 Camas TMDL pgs. 180–182.</div> <div>b. TSS load calculated from 2014 Camas sampling, expressed as peak TSS tons/year.</div> <div>c. TMDL Target expressed as a load capacity (in tons/year) or as bank stability (as a percentage).</div> <div>d. Target Status expressed as achieved or not achieved.</div>					

Sediment TMDL

The 2005 Camas TMDL states the following:

Sediment is impacting beneficial uses of Elk Creek in the form of bed load sediment. Suspended sediment measured during drought years is not impacting water quality of the stream, however bed load sediment measured in the form of percent fines indicates that sediment is impacting water quality. A value greater than 35% for percent fines was used to indicate that sediment was impacting the water body. If this was the case then stream bank erosion inventories were completed to determine if stream bank erosion was the contributor of sediment impact. The target for stream bank erosion TMDLs is 80% bank stability. (DEQ 2005, pg. 180)

Sampling in 2014 included analysis for TSS and yielded instantaneous loads displayed in Table 44. TSS loads are significantly lower than the sediment load capacity identified in the 2005 Camas TMDL (63.6 tons/year). Although these numbers cannot be compared directly, the TSS numbers do show that the water column loads are responsive to flow and are relatively low.

The bank stability inspection performed for this water body in June 2014 identified two vulnerable areas as uncovered-stable. These two segments are incised with no canopy cover, which is likely a result of historic grazing based on the hardened trail ways and crossings through these areas. This suggests that this activity led to destabilization of the riparian areas in these two areas causing channel down cutting followed by a recession of the water table. Currently, sagebrush and upland plants are adjacent to the stable banks but no vegetation has reestablished in the channel bottom or on the banks. Livestock use continued at the current—or reduced—stocking rate will allow these remaining two areas to also recover in time. Based on the visual inspection and considering historic conditions, the overall bank condition of this AU is improving and is now achieving the TMDL target of 80% stability.

Three BURP assessments have been attempted in ID17040220SK006_02 since 1993. The 1993 visit produced low scores for both macroinvertebrates and habitat. The visits in 2001 and 2014 both observed dry channel conditions, consistent with the 2014 review findings that this AU is entirely ephemeral. Because BURP protocol is only intended for assessment of perennial streams, the score associated with the 1993 visit is not representative of the conditions of this stream and flow regime. Therefore, the BURP assessments do not inform the performance of the TMDL in this AU.

2.4.7 Camas Creek (US-7)

For an overview of this WBID, see Figure 42.

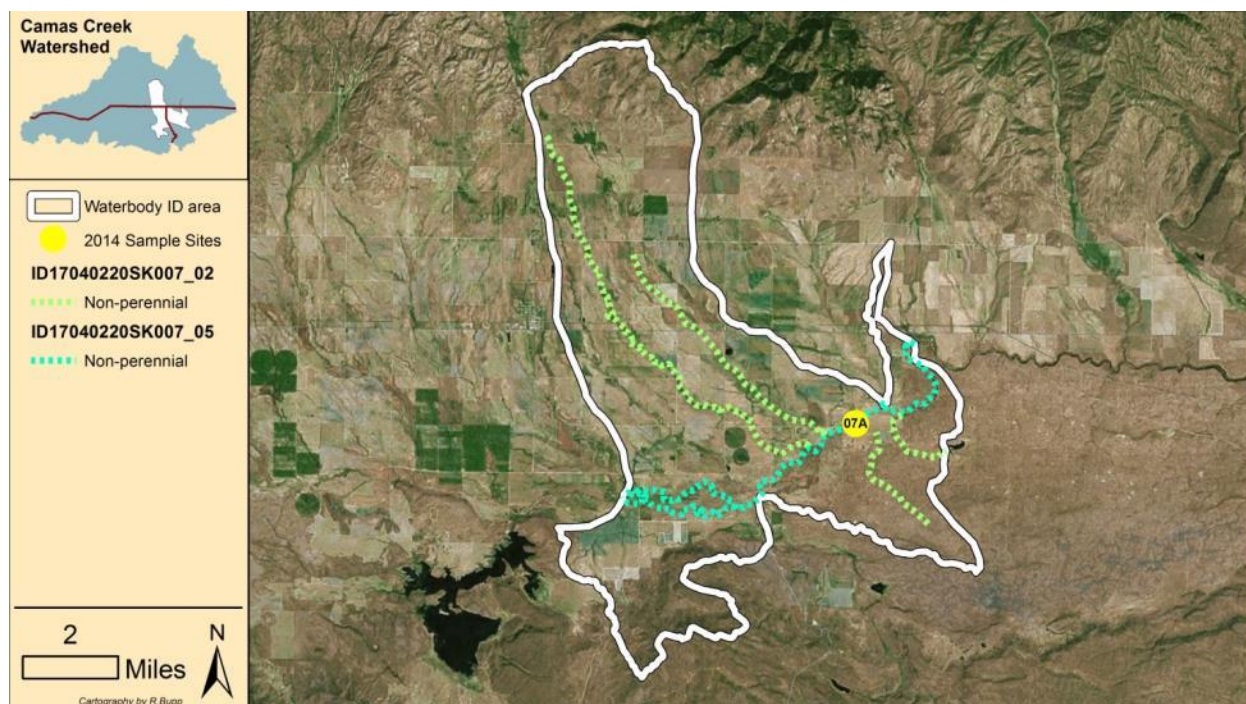


Figure 42. WBID US-7, Camas Creek – Soldier Creek to Elk Creek.

2.4.7.1 Assessment Units

AU ID17040220SK007_02 includes the 1st- and 2nd-order nonperennial tributaries contributing to the 5th-order of Camas Creek, totaling 12.15 miles. Segments are ephemeral/episodic, exhibiting flows only in direct response to snowmelt, precipitation events, or irrigation runoff.

AU ID17040220SK007_05 is the 5th-order of Camas Creek beginning at Soldier Creek and ending at Elk Creek for a total channel length of 14.42 miles. This segment is ephemeral, exhibiting flows only in direct response to snowmelt, ground water expression, or precipitation events (Table 48).

Powell Creek/Minear Creek Cartographic Error

During the 2014 sampling effort, the geographic extent of Powell Creek and Minear Creek were discovered to be incorrectly represented by the DEQ spatial layer. This anomaly originated from a cartographic error in the USGS 100K National Hydrologic Dataset (NHD) that displays Powell Creek and Minear Creek as one connected linear feature. In the USGS 24K “high-res” NHD, Powell Creek is displayed as discharging to US-11, Soldier Creek. Also, Minear Creek is shown to diverge from Soldier Creek downstream of Powell Creek. Field inspection confirmed that Powell Creek is unique from Minear Creek. Powell Creek will remain in WBID US-10 (ID17040220SK010_02) while Minear Creek is a 1st-order tributary to WBID US-7 (feature of ID17040220SK007_02).

Table 48. Camas Creek (US-7) assessment units.

Idaho's 2012 Integrated Report				AU		Stream Segment			
Identified to have zero flow				ID17040220SK007_02		Knowlton Creek Unnamed tributaries of Camas Creek; Soldier Creek to Elk Creek			
Category 3: Unassessed Waters				ID17040220SK007_02		Camas Creek – Soldier Creek to Elk Creek 12.15 MILES			
Category 4a: Impaired Waters with approved TMDLs				ID17040220SK007_05		Camas Creek – Soldier Creek to Elk Creek 14.42 MILES			
Beneficial Use		_02	_05	Causes			Reference		
Cold water aquatic life		NA	NS	Phosphorus (Total) Sedimentation/Siltation Temperature, water			ADB: Assessment 9/13/2002 TMDL (pg. 201): Lack of flow		
Salmonid spawning		NA	NA						
Primary contact recreation		NA	NA						
Agricultural water supply		NA	NA						
Industrial water supply		NA	NA						
Wildlife habitat		NA	NA						
Aesthetic		NA	NA						
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtnng	Score	Rtnng	Score	Rtnng	
02	2001STWFA042	Knowlton Creek							—Dry—
02	2014STWFA037	Knowlton Creek							—Dry—
05	1995STWFA016	Camas Creek	23.45	0.00	—	—	37.00	1.00	0.00
05	2007STWFA015	Camas Creek							—Denied Access—
05	2010SDEQA090	Camas Creek							—Dry—
05	2014STWFA052	Camas Creek							—Dry—

2.4.7.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-7:

1. All stream segments comprising AUs ID17040220SK007_05 and _02 are ephemeral.
2. Reduced flow following spring runoff is a result of losses to ground water.
3. Mid-summer flows present in Minear Creek result from diversion from Soldier Creek; thus, Minear Creek is employed as an irrigation conveyance at that time. The current connection of diverted water from Soldier Creek to Minear Creek is

manmade. Minear Creek is an ephemeral channel, potentially once associated with Soldier Creek as it originates on the Soldier Creek alluvial fan.

Flow

Flows were collected for this reach of Camas Creek at sampling location 17040220-07A, at the bridge upstream of Deer Creek. Flows measured in April and May provided the most significant discharges at 49.12 cfs, 18.56 cfs, and 15.60 cfs. In early June, the instream flow receded significantly to 1.04 cfs. All subsequent visits in July, August, and September yielded a dry channel (Figure 43).

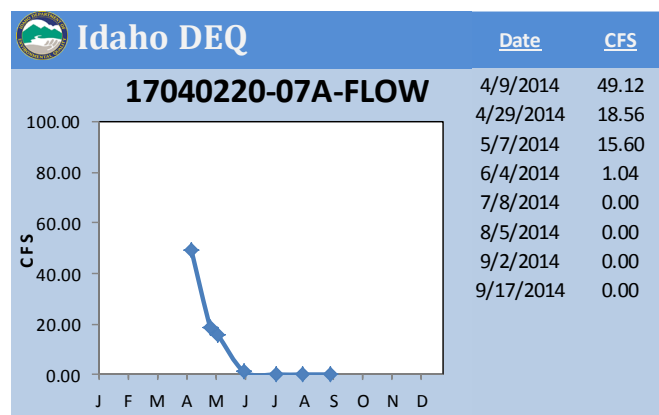


Figure 43. Flows at 17040220-07A, 2014.

The 2005 Camas TMDL suggests nonperennial hydrologic conditions in portions of Camas Creek (DEQ 2005, pgs. 147–149). This condition is currently occurring and applies to all of this section of Camas Creek (ID17040220SK007_05) and WBID tributaries (ID17040220SK007_02). The channels of Knowlton Creek and Minear Creek may be used through the summer for irrigation water conveyance but possess a naturally ephemeral flow regime.

Past Conditions

The 2005 Camas TMDL states the following regarding the whole of Camas Creek:

Through the subbasin assessment process, it has been identified that the water quality and beneficial uses of Camas Creek are being impacted by pollutants. The pollutants of concern in the water body have been found to be sediment, nutrients, and temperature. Nutrients are a pollutant to Camas Creek as well as to Magic Reservoir the receiving water of Camas Creek...

...Lack of flow is the largest impact to beneficial uses of Camas Creek. (DEQ 2005, pg. 201)

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 44). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 49).



Figure 44. Sample site 17040220-07A, 4/09/2014 and 8/05/2014.

Table 49. Camas Creek (US-7) water chemistry.

17040220-07A Camas Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TSS	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100 mL	ft ³ /sec
4/9/2014	<0.010	<0.010	0.83	0.061	<5.0	8.6	49.12
4/29/2014	—	—	—	—	—	—	18.56
5/7/2014 ¹	<0.010	<0.010	0.64	0.057	<5.0	18.9	15.60
6/4/2014	<0.010	<0.010	0.57	0.051	<5.0	57.3	1.037
7/8/2014	—	—	—	—	—	—	dry
8/5/2014	—	—	—	—	—	—	dry
9/2/2014	—	—	—	—	—	—	dry
9/17/2014	—	—	—	—	—	—	dry
1. Creek very clear; water level visibly retreating							

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-07A to represent nutrient discharge into downstream waters. This sample site is located on AU ID17040220SK007_05 at the bridge upstream of Deer Creek. Nutrients specific to ID17040220SK007_02 were not reviewed in 2014.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 50). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 50. Camas Creek (US-7) nutrient summary.

17040220-07A Camas Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TP:TN Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	<0.010	0.830	0.061	13.8	--	0.269
May	<0.010	0.640	0.057	11.4	--	0.080
June	<0.010	0.570	0.051	11.4	--	0.005
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--

¹ TP:TN ratios -- Values > 16 = P Limiting Values < 10 = N Limiting

² (TP [mg/l] *0.08982555)Flow [ft³/sec] = TP load [lbs/day]

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-07A to represent TSS discharge into downstream waters. This sample site is located on AU ID17040220SK007_05 at the bridge upstream from Deer Creek. TSS specific to ID17040220SK007_02 was not assessed in 2014.

All samples were less than detectable limits for TSS in this water body. Visual observation while wading supported that this segment of Camas Creek exhibited high clarity. A concentration of 5 mg/L TSS was used to calculate the loads displayed in Table 51.

Table 51. Camas Creek (US-7) total suspended solids.

17040220-07A Camas Creek			
Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	<5.0	49.12	4.03
May	<5.0	15.60	1.28
June	<5.0	1.04	0.08
July	--	dry	--
August	--	dry	--
September	--	dry	--

¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-07A are displayed in Table 52 and do not indicate any *E. coli* concentrations above trigger values.

Table 52. Camas Creek (US-7) *E. coli*.

17040220-07A Camas Creek			
Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/100 mL	ft ³ /sec	
April	8.6	49.12	--
May	18.9	15.60	--
June	57.3	1.04	--
July	--	dry	--
August	--	dry	--
September	--	dry	--
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Temperature

A thermograph was deployed in this water body to capture hourly water temperature measurements. The temperature plot for 4/30/2014–7/01/2014 is displayed in Figure 45. The plot indicates that AU ID17040220SK007_05 has exceedances of the instantaneous numeric criteria of 22 °C for the CWAL beneficial use as defined in IDAPA 58.01.02.250.02.b during the measurement period. Additionally, many instantaneous exceedances are seen for the SS beneficial use criteria of 13 °C.

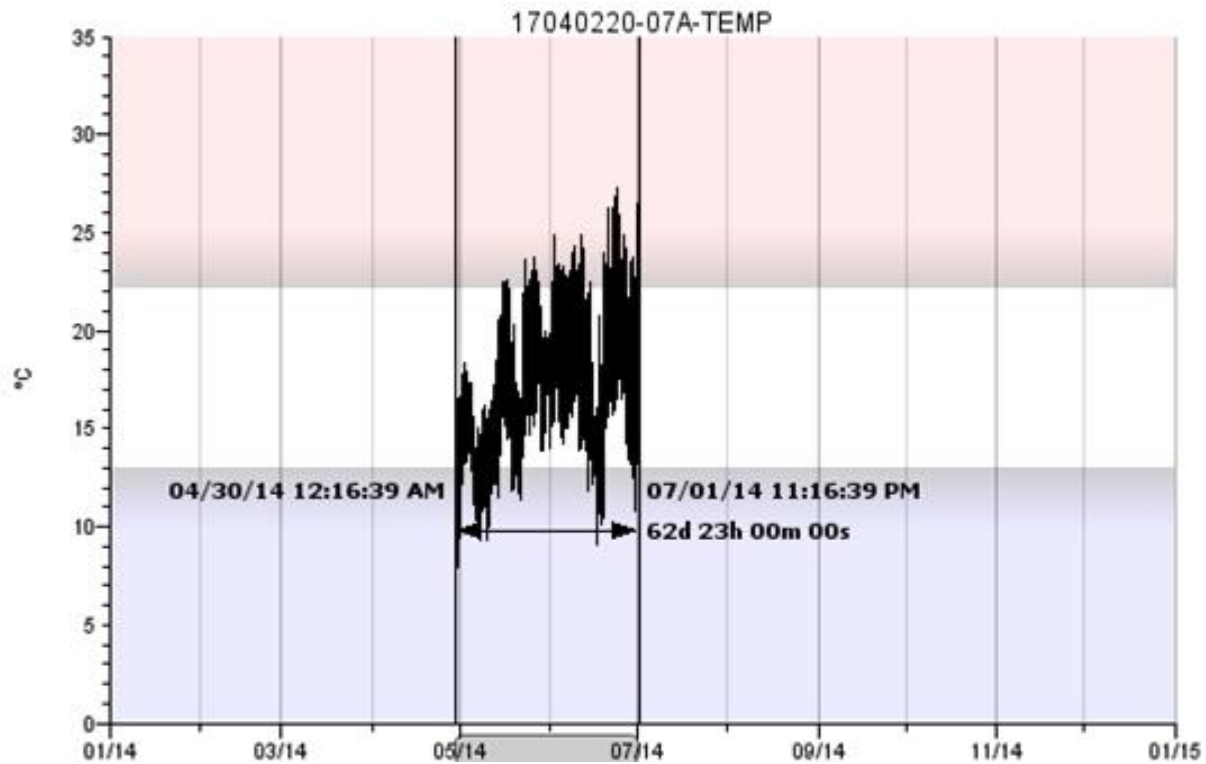


Figure 45. Camas Creek (US-7) thermograph.

Analysis of this temperature data set identified average criteria exceedances for SS. For the period analyzed, 84% of the water temperature daily averages exceeded the criteria for SS at 9 °C. The exceedance analysis summary is provided in Table 53, and the complete exceedance analysis is included Appendix A.

Table 53. Exceedances for site 17040220-07A, 4/30/2014–7/01/2014.

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prct	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Eval'd & Date Range	85	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prct	
13 °C Instantaneous Spring	74	80%	
9 °C Average Spring	77	84%	
Spring Days Eval'd w/in Dates	92	15-Apr	15-Jul
13 °C Instantaneous Fall	0	0%	
9 °C Average Fall	0	0%	
Fall Days Eval'd w/in Dates	0	15-Sep	15-Nov
13 °C Instantaneous Total *	74	80%	
9 °C Average Total *	77	84%	
Tot Days Eval'd w/in Both Dates *	92		

2.4.7.3 TMDL Targets, Loads, and Status

The 2005 Camas TMDL set pollutant load targets for the primary Camas Creek channel as a whole. The loads specific to AUs ID17040220SK007_05 and SK007_02 were not prescribed individually. Interpolated past load, current load, and current status are displayed in Table 54.

Table 54. Camas Creek (US-7) TMDL load summary and status.

AU	TMDL Pollutant	2005 Load ^a	2014 Loads ^b	TMDL Target ^c	Target Status ^d
ID17040220SK007_02	----- No TMDL -----				
ID17040220SK007_05 ^e	Nutrients (lb/day TP)	130.49	0.269	Load capacity 61.55 lb/day	Target achieved
			0.095	Max. conc. 0.050 mg/L	Target exceeded
			0.071		
	Sediment (t/yr)	8,018.8 ^f	4.03	Load capacity 512.6 t/yr	Target achieved
			1.28	80% bank stability	Status unknown
			0.08		
	Temperature Solar Load ^g (kWh/day)		2,593,500	2,264,300 kWh/day	Target exceeded
			Varied segment % deficiencies	Shade % per segment	Target exceeded
a. Loads identified in the 2005 Camas TMDL pgs. 201–205.					
b. Calculated from 2014 sampling results.					
c. TMDL targets prescribed in the 2005 Camas TMDL pgs. 201–205.					
d. Target status determined as described in this section’s narrative.					
e. 2005 TMDL combined all Camas Creek AUs in load analysis and target prescription.					
f. The 2005 sediment load was calculated with erosion rate, bank height, and quantity of streambank stability.					
g. Target status determined as described in the draft 2016 Camas Creek temperature PNV analysis.					

Sediment TMDL

The 2005 Camas TMDL states the following:

Sediment is impacting beneficial uses of Camas Creek in the form of bed load sediment. Suspended sediment measured during drought years is not impacting water quality of the stream, however bed load sediment measured in the form of percent fines indicates that sediment is impacting water quality. A value greater than 35% for percent fines was used to indicate that sediment was impacting the water body. If this was the case then stream bank erosion inventories were completed to determine if stream bank erosion was the contributor of sediment impact. The target for stream bank erosion TMDLs is 80% bank stability. (DEQ 2005)

Sampling in 2014 included analysis for TSS and yielded instantaneous loads as displayed in Table 51. Existing TSS loads are significantly lower than the sediment load identified in the 2005 Camas TMDL (8,018.8 tons/year). Although these numbers cannot be compared directly, the TSS numbers do show that the water column loads in this AU are responsive to flow and are relatively low.

A BURP assessment was performed for ID17040220SK007_05 in 1995. A review of the habitat data for site 2011STWFA018 shows total fines less than 35% and combined streambank stability

of greater than 80%. However, the assessment guidance (Grafe et al. 2002) clarifies that the methodology used by BURP for stream assessment is not intended for nonperennial streams. Therefore, this single BURP review is not a representative measurement of system conditions.

A walking bank stability inspection was not performed in 2014 due to lack of access to private property.

Nutrient TMDL

The 2005 Camas TMDL states the following:

Nutrients are impacting the CWAL beneficial uses of Camas Creek, but as the creek discharges into a reservoir the TMDL is completed to limit nutrient delivery to the reservoir. The target for water bodies discharging into a storage system is 0.050 mg/L. This goal should aid limiting excessive delivery of nutrients to the reservoir. As a result 0.050 mg/L is the target to be used in the development of a nutrient TMDL for Camas Creek. (DEQ 2005)

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. To review performance of the TMDL, instantaneous daily loads for TP have been calculated for each sample event (Table 55). These daily loads are significantly lower than the load capacity recorded in the TMDL (61.55 lb/day), and the concentrations were higher than the TMDL maximum of 0.050 mg/L. For these reasons, the TP loads are far below the daily load capacity in Camas Creek but consistently exceed the target TMDL concentration.

Table 55. Camas Creek (US-7) total phosphorus loads.

17040220-07A Camas Creek			
Total Phosphorus Load			
Sample Date	TP	Flow	TP Load¹
	mg/L	cfs	lbs/day
April	0.061	49.12	0.269
May	0.057	15.60	0.080
June	0.051	1.04	0.005
July	--	dry	--
August	--	dry	--
September	--	dry	--
¹ (TP [mg/L] *0.08982555)Flow [cfs] = TP load [lbs/day]			

Temperature TMDL

A PNV analysis was completed for this water body in 2016 to re-evaluate segment shade targets and heat loading. As a result, a new total solar load target is set at 2,264,300 kWh/day for AU SK007_05 (Table 56).

Table 56. Camas Creek (US-7) heat load summary.

US-7; Camas Creek			
PNV Temperature Loads¹			
AU	Target	Existing	Excess
	kWh/day	kWh/day	kWh/day
007_05	2,264,300	2,593,500	329,200

¹ Solar loading from 2016 PNV Analysis.

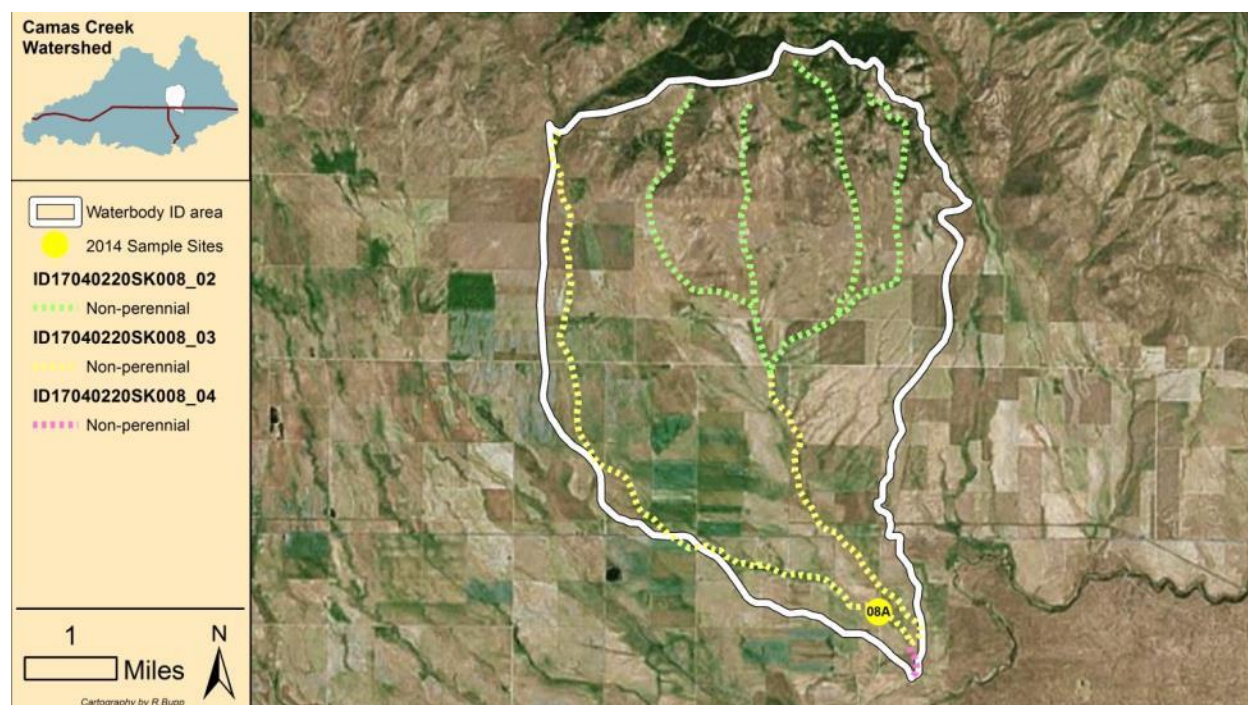
The existing shade for each segment was found to vary. Some segments meet or exceed the shade potential, and some segments are shade deficient. The calculated existing heat load based on existing shade is 2,593,500 kWh/day for SK007_05.

Based on the 2016 PNV shade analysis, thermograph data set, and discharge measurements from site 17040220-07A, the following conclusions are drawn for water temperature:

- AU ID17040220SK007_05 is exceeding the heat loading target prescribed in the 2016 Camas PNV analysis.
- AU ID17040220SK007_05 exceeded the average criteria for SS 84% of sampled days. Salmonid spawning has not been assessed for this AU.
- Both the PNV shade analysis and temperature exceedance analysis indicate temperature impairment; however, the greatest impairment to the beneficial uses in this AU appears to be a result of the ephemeral (dry) condition, not heat loading.

2.4.8 Deer Creek (US-8)

For an overview of this WBID, see Figure 46.

**Figure 46. WBID US-8, Deer Creek – Big Deer Creek to mouth.**

2.4.8.1 Assessment Units

AU ID17040220SK008_02 includes the 1st- and 2nd-order tributaries contributing to the 3rd-order of Daugherty Creek, totaling 13.51 miles. All segments are ephemeral, exhibiting flows in direct response to snowmelt and precipitation events.

AU ID17040220SK008_03 includes the 3rd-order channels of both Daugherty Creek and Deer Creek, totaling 11.78 miles. These segments are ephemeral, exhibiting flows in direct response to snowmelt and precipitation events.

AU ID17040220SK008_04 is the 4th-order of Deer Creek, which begins at the confluence of Deer Creek and Daugherty Creek and continues 0.38 miles to Camas Creek. This segment is ephemeral (Table 57).

Table 57. Deer Creek (US-8) assessment units.

Idaho’s 2012 Integrated Report				AU	Stream Segment				
Identified to have zero flow				ID17040220SK008_02	Daugherty Creek				
				ID17040220SK008_03	Deer Creek Daugherty Creek				
Category 3: Unassessed Waters				ID17040220SK008_02	Deer Creek – Big Deer Creek to mouth 13.51 MILES				
				ID17040220SK008_03	Deer Creek – Big Deer Creek to mouth 11.78 MILES				
				ID17040220SK008_04	Deer Creek – Big Deer Creek to mouth 0.38 MILES				
Beneficial Use		_02	_03	_04	Causes		Reference		
Agricultural water supply		NA	NA	NA					
Industrial water supply		NA	NA	NA					
Wildlife habitat		NA	NA	NA					
Aesthetic		NA	NA	NA					
Note: The beneficial uses “Cold Water Aquatic Life” and “Secondary Contact Recreation” are not identified for these AUs in DEQ’s Assessment Database (ADB), although they are presumed uses for all water bodies as per IDAPA 58.01.02.									
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	2001STWFA040	Daugherty Creek							—Dry—
03	1996STWFB073	Deer Creek							—Dry—
03	2008STWFA044	Deer Creek							—Dry—
03	2014STWFA035	Deer Creek							—Dry—

2.4.8.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 for WBID US-8 are as follows:

1. All stream segments comprising WBID US-8 are ephemeral (Figure 47).
2. Spring flows are in direct response to snowmelt.
3. The water quality conditions in this water body are currently dictated by the flow regime.



Figure 47. Deer Creek (US-8) 6/04/2014. Ephemeral flow regime in Deer Creek dictates water quality potential.

Flow

Flows were collected for Deer Creek at sampling location 17040220-08A, above the Bar Ranch Road culvert. April and May provided the only flow measurements at 6.30 cfs and 2.41cfs, respectively (Figure 48). All streams in this water body were dry through September 2014.

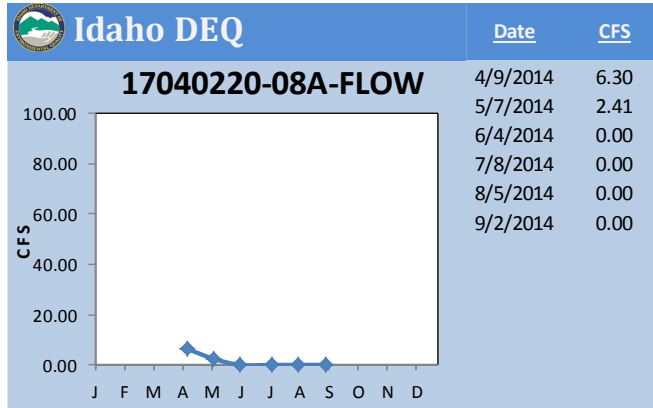


Figure 48. Flows at 17040220-08A, 2014.

Past Conditions

The 2005 Camas TMDL did not address conditions of WBID US-8 as a whole, nor any individual components of this WBID. All previous BURP assessments recorded dry conditions for Daugherty Creek and Deer Creek.

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 49). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 58).



Figure 49. Sample site 17040220-08A, 4/09/2014 and 8/05/2014.

Table 58. Deer Creek (US-8) water chemistry.

17040220-08A Deer Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	TP	TSS	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100 mL	ft ³ /sec
4/9/2014	<0.010	0.013	0.37	0.051	6	32.7	6.300
5/7/2014 ¹	<0.010	<0.010	0.32	0.025	<5.0	13.4	2.406
6/4/2014	—	—	—	—	—	—	dry
7/8/2014	—	—	—	—	—	—	dry
8/5/2014	—	—	—	—	—	—	dry
9/2/2014	—	—	—	—	—	—	dry
1. Clear; no turbidity							

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-08A to represent nutrient discharge into downstream waters. This sample site is located on AU ID17040220SK008_03 upstream from the confluence with Daugherty Creek. Nutrients specific to ID17040220SK008_02 and SK008_04 were not reviewed in 2014.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 59). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 59. Deer Creek (US-8) nutrient summary.

17040220-08A Deer Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TP:TN Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	0.013	0.370	0.051	7.5	N Limited	0.029
May	<0.010	0.320	0.025	13.2	--	0.005
June	--	--	--	--	--	--
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--
¹ TP:TN ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
² (TP [mg/l] *0.08982555)/Flow [ft3/sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-08A to represent TSS discharge into downstream waters. This sample site is located on AU

ID17040220SK008_03, upstream from the confluence with Daugherty Creek. TSS specific to ID17040220SK008_02 and SK008_04 was not assessed in 2014.

For the six sampling events at this location, water was present only during April and May. TSS was very low for both samples (Table 60).

Table 60. Deer Creek (US-8) total suspended solids.

17040220-08A Deer Creek Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	6	6.3	0.62
May	<5.0	2.41	0.20
June	--	dry	--
July	--	dry	--
August	--	dry	--
September	--	dry	--

¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-08A are displayed in Table 61 and do not indicate any *E. coli* concentrations above trigger values.

Table 61. Deer Creek (US-8) *E. coli*.

17040220-08A Deer Creek Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/ 100mL	ft3/sec	
April	32.7	6.30	--
May	13.4	2.41	--
June	--	dry	--
July	--	dry	--
August	--	dry	--
September	--	dry	--

¹ > 406cfu/100ml for Primary Contact Recreation
> 576 cfu/100ml for Secondary Contact Recreation

Temperature

No temperature data were collected for US-8 in 2014.

2.4.8.3 TMDL Targets, Loads, and Status

No TMDLs were developed for the AUs in this water body.

2.4.9 Deer Creek (US-9)

For an overview of this WBID, see Figure 50.

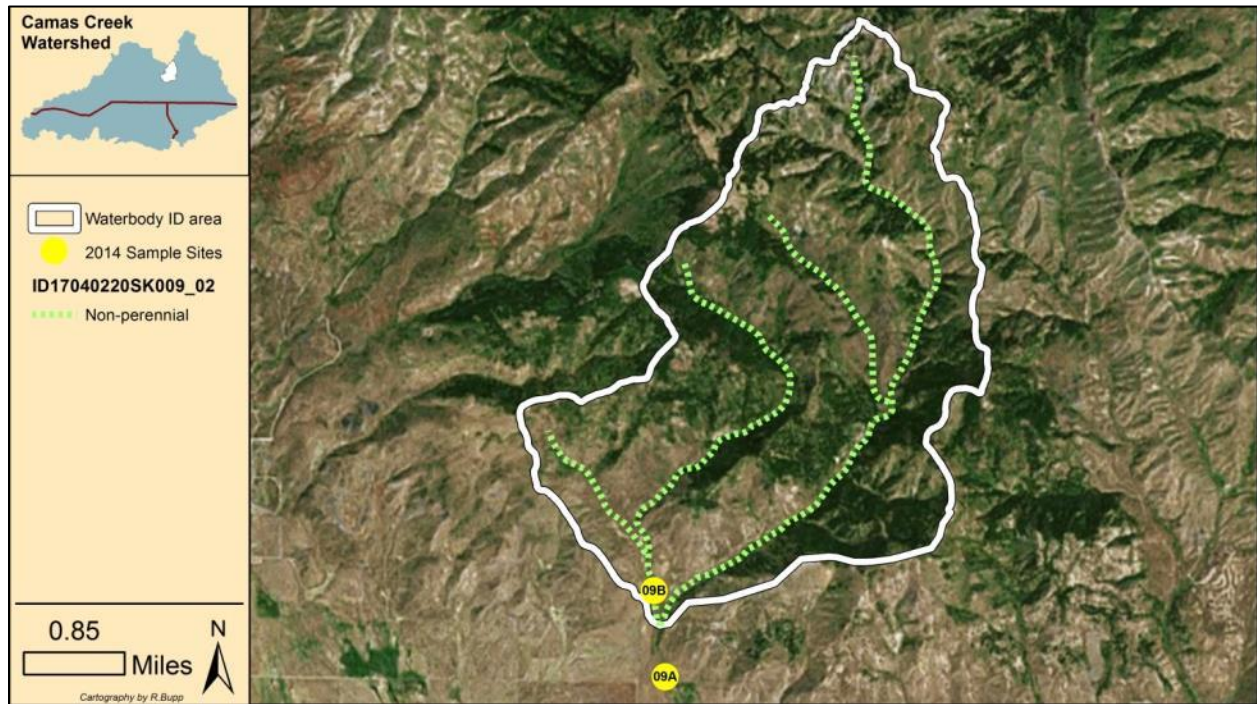


Figure 50. WBID US-9, Deer Creek – source to and including Big Deer Creek.

2.4.9.1 Assessment Units

AU ID17040220SK009_02 includes the 1st- and 2nd-order tributaries contributing to the 3rd-order of Deer Creek (US-8), totaling 13.79 miles. All segments are ephemeral, exhibiting flows in direct response to snowmelt and precipitation events (Table 62).

Table 62. Deer Creek (US-9) assessment unit.

Idaho's 2012 Integrated Report		AU		Stream Segment					
Identified to have zero flow		ID17040220SK009_02		Big Deer Creek					
				Chicken Creek					
Category 3: Unassessed Waters		ID17040220SK009_02		Deer Creek					
				Little Deer Creek					
Category 3: Unassessed Waters		ID17040220SK009_02		Deer Creek – source to and including Big Deer Creek 13.79 MILES					
Beneficial Use		_02	Causes		Reference				
Agricultural water supply		NA							
Industrial water supply		NA							
Wildlife habitat		NA							
Aesthetic		NA							
Note: The beneficial uses “Cold Water Aquatic Life” and “Secondary Contact Recreation” are not identified for these AUs in DEQ’s Assessment Database (ADB), although they are presumed uses for all water bodies as per IDAPA 58.01.02.									
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	2001STWFA032	Deer Creek							—Dry—

2.4.9.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 for WBID US-9, Deer Creek, were as follows:

1. All stream segments comprising WBID US-9 are ephemeral.
2. Spring flows are in direct response to snowmelt.
3. The water quality conditions in this water body are currently dictated by the flow regime (Figure 51).



Figure 51. Deer Creek (US-9), 7/08/2014. Ephemeral flow regime in Deer Creek dictates water quality potential.

Flow

Flows were collected for Deer Creek at sampling location 17040220-09A, approximately 0.75 miles downstream of the confluence of Big Deer Creek and Little Deer Creek. Flows were measured for April, May, and June. A dry channel was observed during the sampling visits in July, August, and September (Figure 52).

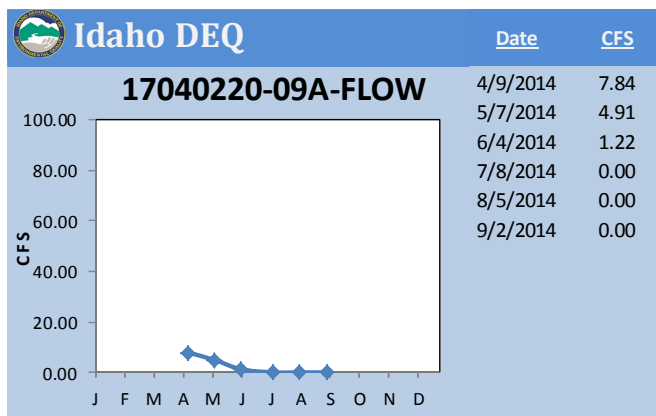


Figure 52. Flows at 17040220-09A, 2014.

Past Conditions

The 2005 Camas TMDL did not address conditions of WBID US-9 as a whole, nor any individual components of this WBID.

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 53). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 63).



Figure 53. Sample site 17040220-09A, 5/7/2014 and 8/05/2014.

Table 63. Deer Creek (US-9) water chemistry.

17040220-09A Deer Creek								
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TSS	E. coli	Flow	
	mg/L	mg/L	mg/L	mg/L		MPN/100 mL		
4/9/2014	<0.010	0.16	0.36	0.074	32	12.0	7.838	
5/7/2014	<0.010	0.066	0.36	0.029	7.5	7.5	4.910	
6/4/2014	<0.010	<0.010	0.21	0.024	<5.0	33.2	1.218	
7/8/2014	—	—	—	—	—	—	dry	
8/5/2014	—	—	—	—	—	—	dry	
9/2/2014	—	—	—	—	—	—	dry	
17040220-09B Deer Creek								
7/8/2014	—	—	—	—	—	—	dry	

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-09A to represent nutrient discharge into downstream waters. This sample site is located below AU ID17040220SK009_02 in the Deer Creek channel.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 64). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 64. Deer Creek (US-9) nutrient summary.

17040220-09A Deer Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TP:TN Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	0.160	0.360	0.074	7.0	N Limited	0.052
May	0.066	0.360	0.029	14.7	--	0.013
June	<0.010	0.210	0.024	9.2	N Limited	0.003
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--
¹ TP:TN ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
² (TP [mg/l] *0.08982555)Flow [ft ³ /sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-09A to represent TSS discharge into downstream waters.

The April sample yielded the highest TSS concentration for this water body, which is also reflected in the instantaneous load (Table 65).

Table 65. Deer Creek (US-9) total suspended solids.

17040220-09A Deer Creek			
Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	32	7.838	4.11
May	8	4.91	0.60
June	<5.0	1.22	0.10
July	--	dry	--
August	--	dry	--
September	--	dry	--
¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]			

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-09A are displayed in Table 66 and do not indicate any *E. coli* concentrations above trigger values.

Table 66. Deer Creek (US-9) *E. coli*.

17040220-09A Deer Creek			
Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/100mL	ft3/sec	
April	12.0	7.84	--
May	7.5	4.91	--
June	33.2	1.22	--
July	--	dry	--
August	--	dry	--
September	--	dry	--

¹ > 406cfu/100ml for Primary Contact Recreation
> 576 cfu/100ml for Secondary Contact Recreation

Temperature

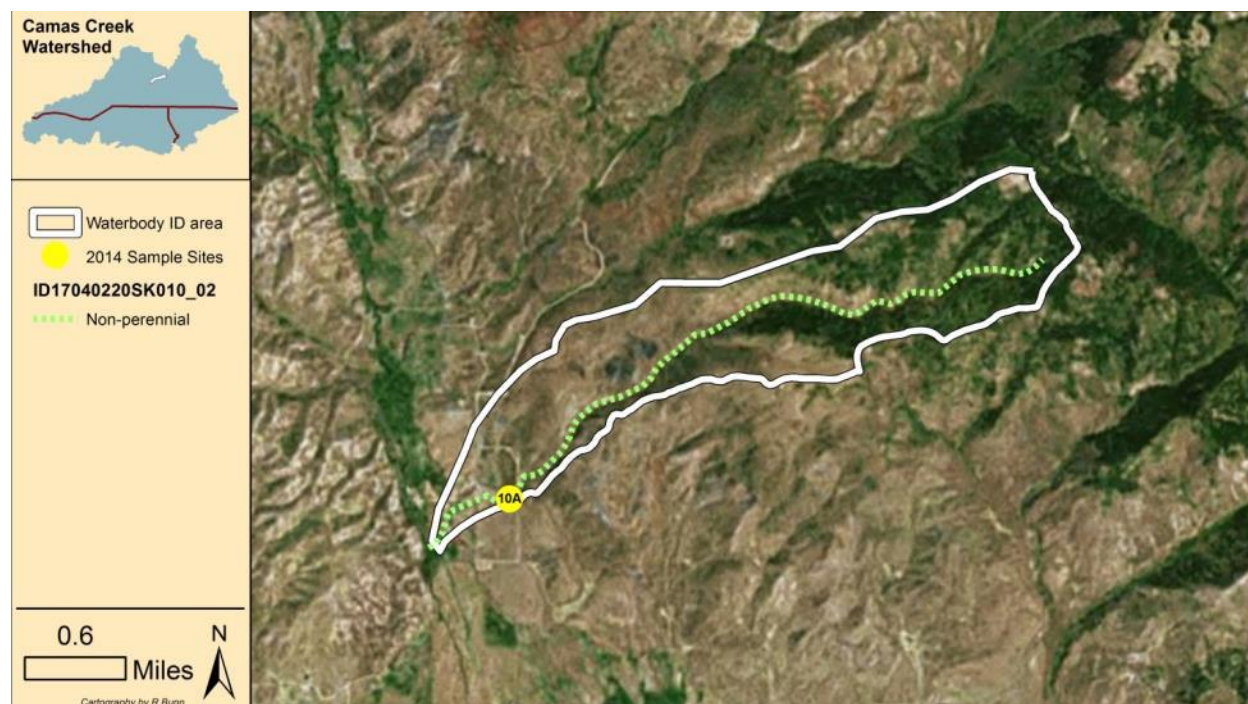
No temperature data were collected for US-9, Deer Creek, in 2014.

2.4.9.3 TMDL Targets, Loads, and Status

No TMDLs were developed for the AU in this water body.

2.4.10 Powell Creek (US-10)

For an overview of this WBID, see Figure 54.

**Figure 54. WBID US-10, Powell Creek – source to mouth.**

2.4.10.1 Assessment Units

AU ID17040220SK010_02 is a 1st-order tributary that discharges to the 3rd-order of Soldier Creek, totaling 16.77 miles. This segment is ephemeral, exhibiting flow in direct response to snowmelt and precipitation (Table 67).

Powell Creek/Minear Creek Cartographic Error

During the 2014 sampling effort, the geographic extent of Powell Creek and Minear Creek were discovered to be incorrectly represented by the DEQ spatial layer. This anomaly originated from a cartographic error in the USGS 100K National Hydrologic Dataset (NHD) that displays Powell Creek and Minear Creek as one connected linear feature. In the USGS 24K “high-res” NHD, Powell Creek is displayed as discharging to US-11 (Soldier Creek). Also, Minear Creek is shown to diverge from Soldier Creek downstream of Powell Creek. Field inspection confirmed that Powell Creek is unique from Minear Creek. This finding allows that Powell Creek remain in WBID US-10 (ID17040220SK010_02) and that Minear Creek is a 1st-order tributary to WBID US-7, Camas Creek (feature of ID17040220SK007_02).

Table 67. Powell Creek (US-10) assessment unit.

Idaho's 2012 Integrated Report			AU		Stream Segment				
Identified to have zero flow			ID17040220SK010_02		Powell Creek				
Category 3: Unassessed Waters			ID17040220SK010_02		Powell Creek – source to mouth 16.77 MILES**				
** The mileage identified for ID17040220SK010_02 is inaccurate per cartographic error.									
Beneficial Use		_02	Causes		Reference				
—No beneficial uses identified in DEQ’s Assessment Database for ID17040220SK010_02—									
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	2001STWFA018	Powell Creek							—Dry—
02	2001STWFA041	Powell Creek							—Dry—
02	2010DEQA080	Powell Creek							—Dry—
02	2014STWFA051	Powell Creek							—Dry—

2.4.10.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-10, Powell Creek:

1. Powell Creek is comprised of a single linear hydrologic feature that is a 1st-order tributary (ID17040220SK010_02) to Soldier Creek.

2. ID17040220SK010_02 is ephemeral, flowing in direct response to snowmelt and precipitation.

Flow

Flows were collected for Powell Creek at sampling location 17040220-10A, at the Soldier Creek Road culvert.

April provided the only measurement of significant discharge at 1.25 cfs (Figure 55). A trace flow of 0.120 cfs was measured in May, with subsequent visits from June through September yielding a dry channel.

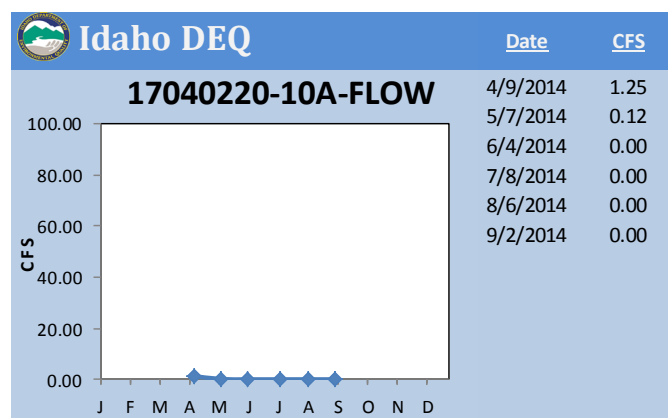


Figure 55. Flow at 17040220-10A, 2014.

Past Conditions

The 2005 Camas TMDL did not disclose any information specific to the water quality or beneficial uses for US-10, Powell Creek.

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 56). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 68).



Figure 56. Sample site 17040220-10A, 4/09/2014 and 7/08/2014.

Table 68. Powell Creek (US-10) water chemistry.

17040220-10A Powell Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TSS	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L		MPN/100mL	
4/9/2014	<0.010	0.35	1.0	0.23	110	29.2	1.254
5/7/2014 ¹	<0.010	<0.010	0.27	0.04	<5.0	3.0	0.119
6/4/2014	—	—	—	—	—	—	dry
7/8/2014	—	—	—	—	—	—	dry
8/6/2014	—	—	—	—	—	—	dry
9/2/2014	—	—	—	—	—	—	dry
1. Flow noticeably diminished. Samples grabbed from culvert outfall.							

Nutrients

Nutrient sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-10A to represent nutrient discharge into downstream waters. This sample site is located on AU ID17040220SK010_02 at the Soldier Creek Road culvert.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 69). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 69. Powell Creek (US-10) nutrient summary.

17040220-10A Powell Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TP:TN Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	0.350	1.000	0.230	5.9	N Limiting	0.026
May	<0.010	0.270	0.040	7.0	N Limiting	0.000
June	--	--	--	--	--	--
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--
¹ TP:TN ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
² (TP [mg/l] *0.08982555)Flow [ft3/sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sample analysis results for TSS in 2014 at 17040220-10A are displayed in Table 70. This sample site is located at the Soldier Creek Road culvert.

Table 70. Powell Creek (US-10) total suspended solids.

17040220-10A Powell Creek			
Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	110	1.254	2.26
May	<5.0	0.12	0.01
June	--	dry	--
July	--	dry	--
August	--	dry	--
September	--	dry	--
¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]			

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-10A are displayed in Table 71 and do not indicate any *E. coli* concentrations above trigger values.

Table 71. Powell Creek (US-10) *E. coli*.

17040220-10A Powell Creek Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/ 100mL	ft ³ /sec	
April	29.2	1.25	--
May	3.0	0.12	--
June	--	dry	--
July	--	dry	--
August	--	dry	--
September	--	dry	--
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Temperature

No historic or current temperature data exist for US-10, Powell Creek.

2.4.10.3 TMDL Targets, Loads, and Status

No TMDLs were developed for the AU in this water body.

2.4.11 Soldier Creek (US-11)

For an overview of this WBID, see Figure 57.

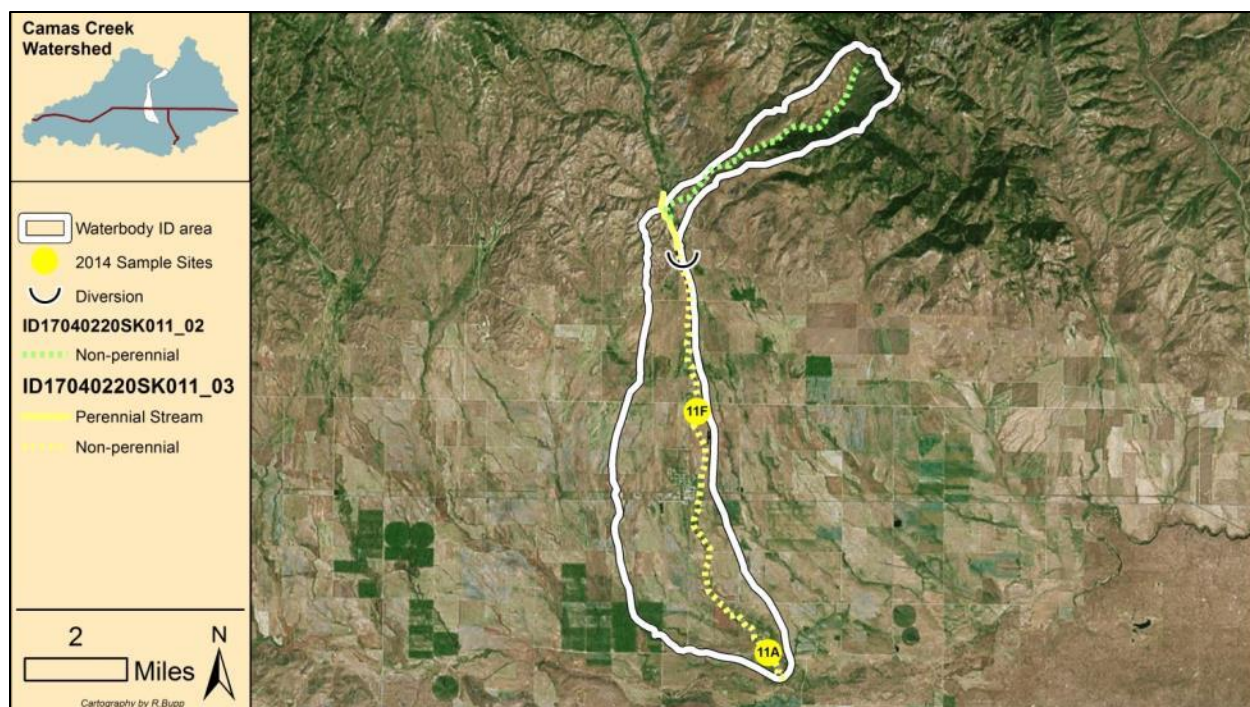


Figure 57. WBID US-11, Soldier Creek – Wardrop Creek to mouth.

2.4.11.1 Assessment Units

AU ID17040220SK011_02 is comprised of a 1st-order tributary contributing to the 3rd-order of Soldier Creek, totaling 14.14 miles. This stream—Sampson Creek—is ephemeral, exhibiting flows in direct response to snowmelt and precipitation events.

AU ID17040220SK011_03 is the 3rd-order of Soldier Creek. This segment begins at the confluence of Soldier and Wardrop Creeks and continues 0.73 miles to Camas Creek. This segment is perennial until it reaches the diversion structure. Below this diversion, flow is dependent on diversion operations (Table 72).

Soldier Creek/Sampson Creek/Mormon Reservoir Canal Cartographic Error

During the 2014 sampling effort, the geographic extent of ID17040220SK011_02 and ID17040220SK011_03 were discovered to be incorrectly represented by the DEQ spatial layer. Corrections to the DEQ spatial layer were initiated in November 2014. The summary of the errors and changes are in Table 73.

This anomaly was not corrected until after the development of the 2012 Integrated Report. Therefore, the beneficial uses and mileages associated with these two Soldier Creek AUs appear as they were identified prior to the spatial feature corrections.

Table 72. Soldier Creek (US-11) assessment units.

Idaho's 2012 Integrated Report				AU		Stream Segment			
Category 2: Full Support				ID17040220SK011_03		Soldier Creek – Wardrop Creek to mouth 5.92 MILES			
Category 4a: Impaired Waters with approved TMDLs				ID17040220SK011_02		Soldier Creek – Wardrop Creek to mouth 15.21 MILES			
Category 4c: Waters Impaired by Pollution				ID17040220SK011_02		Soldier Creek – Wardrop Creek to mouth 15.21 MILES <i>Other flow regime alterations, droughts, flow diversions, aquifer level fluctuations, and channel straightening all contribute to the intermittent status of the lower segments of the creek. See pg. 60 Camas Creek subbasin assessment.</i>			
Beneficial Use		_02	_03	Causes			Reference		
Cold water aquatic life		NS	FS	Sedimentation/Siltation Temperature, water			ADB: 9/13/2002 assessment TMDL (pg. 165): Lack of flow		
Primary contact recreation		FS	—						
Secondary contact recreation		—	FS						
Agricultural water supply		NA	NA						
Industrial water supply		NA	NA						
Wildlife habitat		NA	NA						
Aesthetic		NA	NA						
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	1995STWFA071	Sampson Creek	36.34	1.00	—	—	59.00	3.00	2.00
02	2014STWFA049	Sampson Creek	—Dry—						
03	1993STWFA015	Soldier Creek	42.04	1.00	—	—	17.00	1.00	1.00
03	1995STWFA020	Soldier Creek	26.21	0.00	76.33	2.00	53.00	1.00	0.00
03	2014STWFA039	Soldier Creek	—Dry—						

Table 73. Soldier Creek (US-11) spatial feature corrections.

Water Feature	Previously	Corrected 2016
Soldier Creek	ID17040220SK011_02	ID17040220SK011_03
Sampson Creek	ID17040220SK012_02	ID17040220SK011_02
Mormon Reservoir Canal	ID17040220SK011_03	No AU association

2.4.11.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-11:

1. ID17040220SK011_02 (Sampson Creek) is ephemeral.
2. ID17040220SK011_03 (Soldier Creek) is perennial until it meets the diversion. Downstream flows are ephemeral, dependent on total flow to the diversion and operation of the diversion for irrigation water delivery.
3. ID17040220SK011_03 exists entirely on the Soldier Creek alluvial fan. This AU is a losing reach; flows infiltrate rapidly to ground water (Figure 58).
4. The Fairfield wastewater treatment facility (NPDES permit ID0024384) is permitted to discharge to Soldier Creek; 100% of the effluent may infiltrate in the tail ditch prior to actually joining the Soldier Creek channel.



Figure 58. Soldier Creek assessment unit ID17040220SK011_03 flows infiltrating, 6/25/2014.

Flow

Flows were collected for Soldier Creek at sampling location 17040220-011A at the Manard Road culvert.

The flow measured in early April was significantly more than late April and May (Figure 59). A flow of 5.17 cfs was measured again in June, likely a result of irrigation returns to the Soldier Creek channel. This sampling location was dry in July, August, and September.

As the flow receded, a second sample point (17040220-11F) was established to assist in understanding the hydrology of Soldier Creek. This sample location was dry after June.

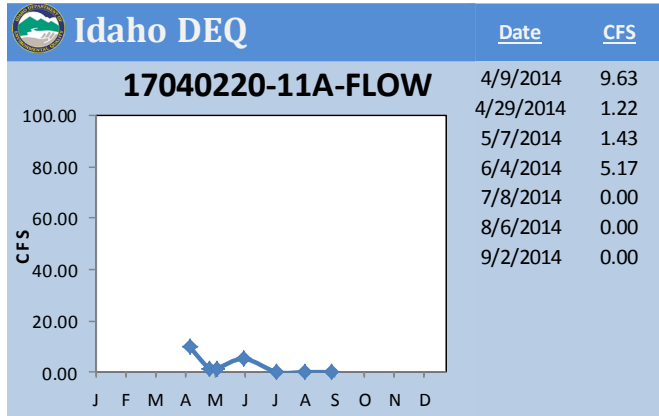


Figure 59. Flows at 17040220-11A, 2014.

Past Conditions

The 2005 Camas TMDL found that sediment and temperature were the pollutants of concern in Soldier Creek and that lack of flow is the largest impact to beneficial uses (DEQ 2005, pg. 165).

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 60). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 74).



Figure 60. Sample site 17040220-11A, 4/09/2014 and 8/06/2014.

Table 74. Soldier Creek (US-11) water chemistry.

17040220-11A Soldier Creek										
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus		TSS		E. coli		Flow
	mg/L	mg/L	mg/L	mg/L		mg/L		MPN/100mL		ft³/sec
4/9/2014	<0.010	<0.010	0.43	0.031		<5.0		39.5		9.629
4/29/2014	—	—	—	—		—		—		1.216
5/7/2014	<0.010	<0.010	0.55	0.049		<5.0		26.5		1.428
6/4/2014	<0.010	<0.010	0.5	0.064		<5.0		60.9		5.172
7/8/2014	—	—	—	—		—		—		no flow
8/6/2014	—	—	—	—		—		—		dry
9/2/2014	—	—	—	—		—		—		dry
17040220-11F Soldier Creek										
6/25/2014	—	—	—	—		—		—		1.004
7/8/2014	—	—	—	—		—		—		no flow
8/6/2014	—	—	—	—		—		—		dry
9/2/2014	—	—	—	—		—		—		dry

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-11A to represent nutrient discharge into downstream waters. This sample site is located on AU ID17040220SK011_03 at the Manard Road culvert, upstream from the confluence with Camas Creek. Nutrients specific to ID17040220SK011_02 were not reviewed in 2014.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 75). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 75. Soldier Creek (US-11) nutrient summary.

17040220-11A Soldier Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TP:TN Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	<0.010	0.430	0.031	14.2	--	0.027
May	<0.010	<0.010	0.049	0.41	N Limiting	0.006
June	<0.010	<0.010	0.064	0.31	N Limiting	0.030
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--
¹ TP:TN ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
² (TP [mg/l] *0.08982555)Flow [ft ³ /sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-11A to represent TSS discharge into downstream waters. This sample site is located on AU ID17040220SK011_03 at the Manard Road culvert, upstream from the confluence with Camas Creek. TSS specific to ID17040220SK011_02 was not reviewed in 2014.

The TSS samples for this water body yielded very low concentrations (Table 76). Using a 5.0 mg/L concentration to estimate theoretical maximum loads, April, May, and June loads were less than 1 ton/year TSS.

Table 76. Soldier Creek (US-11) total suspended solids.

17040220-11A Soldier Creek			
Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	<5.0	9.629	0.79
May	<5.0	1.43	0.12
June	<5.0	5.17	0.42
July	--	no flow	--
August	--	dry	--
September	--	dry	--
¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]			

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-011A are displayed in Table 77 and do not indicate any *E. coli* concentrations above trigger values.

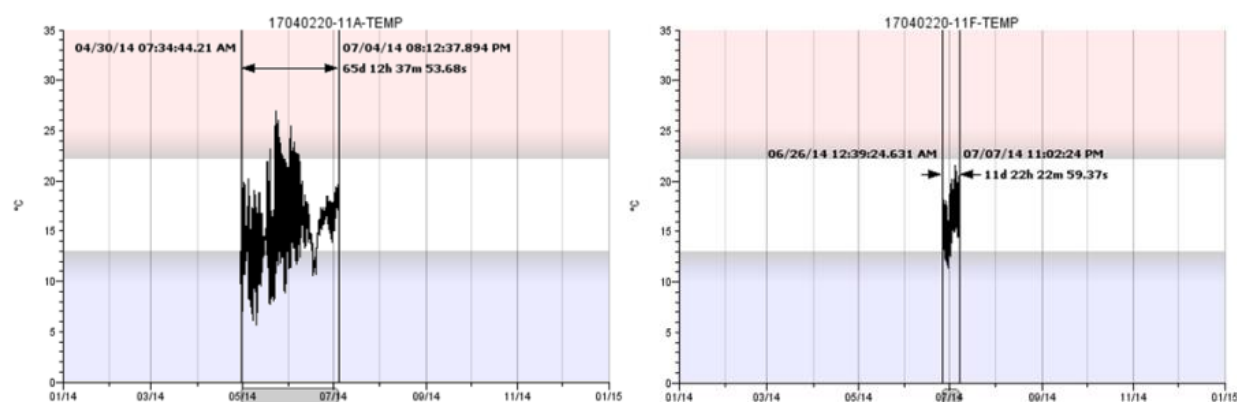
Table 77. Soldier Creek (US-11) *E. coli*.

17040220-11A Soldier Creek			
Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/100mL	ft3/sec	
April	39.5	9.63	--
May	26.5	1.43	--
June	60.9	5.17	--
July	--	no flow	--
August	--	dry	--
September	--	dry	--

¹ > 406cfu/100ml for Primary Contact Recreation
> 576 cfu/100ml for Secondary Contact Recreation

Temperature

A thermograph was deployed in this water body at location 17040220-11A to capture hourly water temperature measurements. As flow receded at the lower-end of Soldier Creek in 2014, a second thermograph was deployed at location 17040220-11F in an attempt to continue monitoring temperature in this water body. By mid-July 2014, the channels were dry at both locations. The temperature plots for both sites are displayed in Figure 61.

**Figure 61. Soldier Creek (US-11) thermographs.**

The plot for 17040220-11A indicates that AU ID17040220SK011_03 has exceedances of the instantaneous numeric criteria of 22 °C for the CWAL beneficial use as defined in IDAPA 58.01.02.250.02.b during the measurement period. Analysis of this temperature data set confirms that 24% of the 66 days measured had instantaneous criteria exceedances and a 2% exceedance of average criteria for CWAL (Table 78).

Table 78. Exceedances for site 17040220-11A, 4/30/2014–7/04/2014.

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prct	
22 °C Instantaneous	16	24%	
19 °C Average	1	2%	
Days Evaluated & Date Range	66	30-Apr	4-Jul

The plot for 17040220-11F indicates no exceedances of the instantaneous numeric criteria of 22 °C during the measurement period. Analysis of this temperature data set confirms that 0% of the 12 days measured experienced instantaneous criteria exceedances and 0% exceedance of average criteria for CWAL.

Point Source

The Fairfield wastewater treatment plant is a point source discharger permitted by the National Pollutant Discharge Elimination System (NPDES) (Figure 62). As stipulated in permit ID0024384, this facility discharges to Soldier Creek (ID17040220SK011_03) via a vegetated tail ditch. The ditch is approximately 1 mile long. Effluent appears to infiltrate along the length of this ditch prior to reaching the Soldier Creek channel.

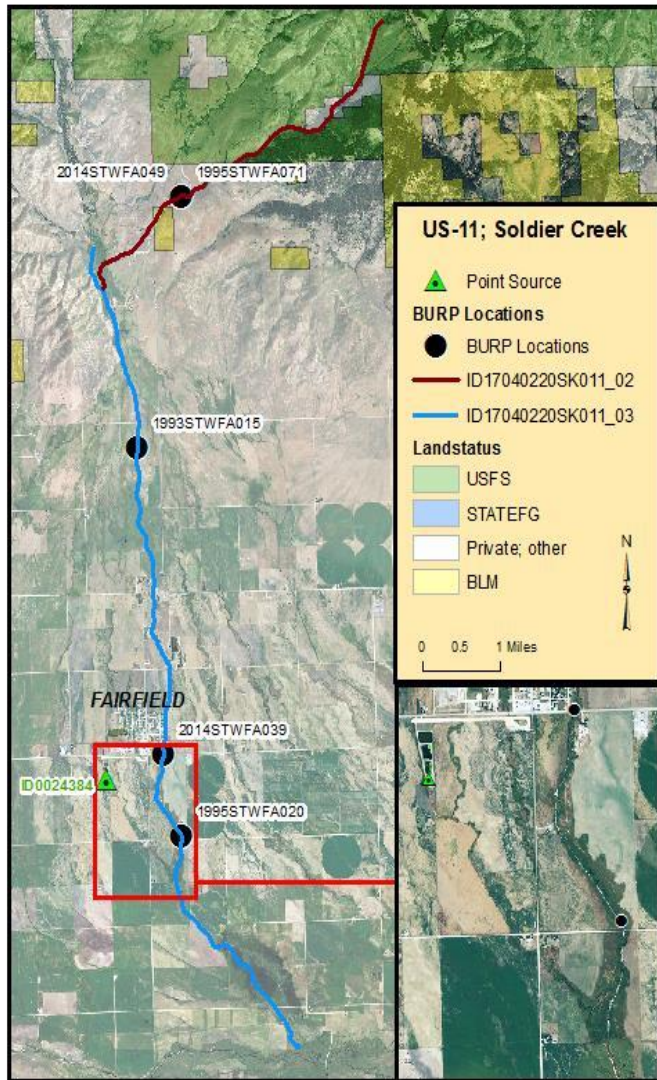


Figure 62. Soldier Creek (US-11) point source and BURP locations.

2.4.11.3 TMDL Targets, Loads, and Status

The 2005 Camas TMDL set sediment and heat load targets for US-11, Soldier Creek. The loads specific to AUs SK011_03 and SK011_02 were not calculated individually at that time. Past load, current load, and current status are displayed in Table 79.

Table 79. Soldier Creek (US-11) TMDL load summary and status.

AU	TMDL Pollutant	2005 Load ^a	2014 Load ^b	TMDL Target ^c	Target Status ^d
ID17040220SK011_02 ^e	----- No TMDL -----				
ID17040220SK011_03 ^e	Sediment (t/yr)	772.2 ^f	0.79	99.2 t/yr	Target achieved
			0.12		
			0.42	< 35% fines	Target achieved
			—		
			—	80% bank stability	Target exceeded
	Temperature Solar Load (kWh/day)	866,897	770,000 ^g	640,000 ^g	Target exceeded
	Shade (% canopy)	55-30	See PNV shade analysis ^h	See PNV shade analysis ^h	Target exceeded
a. Loads identified in the 2005 Camas TMDL pgs. 165–170. b. Calculated from 2014 sampling results; instantaneous TSS loads. c. TMDL targets prescribed in the 2005 Camas TMDL pgs. 165–170. d. Target status determined as described in this section's narrative. e. Assessment units as delineated following spatial error corrections. f. The 2005 sediment load was calculated from erosion rate, bank height, and quantity of streambank stability. g. Heat loads calculated in the 2016 Camas Creek PNV analysis. h. Shade percentages by stream segment identified in the 2016 Camas Creek PNV analysis.					

Sediment TMDL

The 2005 Camas TMDL states the following:

Sediment is impacting the water quality of Soldier Creek in the form of bed load sediment. Suspended sediment measured during drought years is not impacting water quality of the stream, however bed load sediment measured in the form of percent fines indicates that sediment is impacting water quality. A value greater than 35% for percent fines was used to indicate that sediment was impacting the water body. If this was the case then stream bank erosion inventories were completed to determine if stream bank erosion was the contributor of sediment impact. The target for stream bank erosion TMDLs is 80% bank stability. (DEQ 2005)

Sampling in 2014 included analysis for TSS and yielded instantaneous loads displayed in Table 76. TSS loads are significantly lower than the sediment target load identified in the 2005 Camas TMDL (99.2 tons/year). Although these numbers cannot be compared directly, the TSS numbers do show that the water column loads are responsive to flow and are relatively low for this stream.

Temperature TMDL

A stream heat loading review was developed in 2016 using a PNV analysis to update the previous solar load estimates and targets. The 2016 Camas Creek PNV analysis sets individual stream segment shade targets and a total solar load target of 640,000 kWh/day. The existing shade for each segment was found to be of varied percentages, with the resulting current total solar load of 760,000 kWh/day. To meet the temperature target suggested by the PNV analysis, a reduction of 120,000 kWh/day is necessary (Table 80).

Table 80. Soldier Creek (US-11) heat load summary.

US-11; Soldier Creek			
PNV Temperature Loads¹			
AU	Target	Existing	Excess
	kWh/day	kWh/day	kWh/day
011_03	640,000	760,000	120,000

¹ Solar loading from 2016 PNV analysis.

2.4.12 Soldier Creek (US-12)

For an overview of this WBID, see Figure 63.

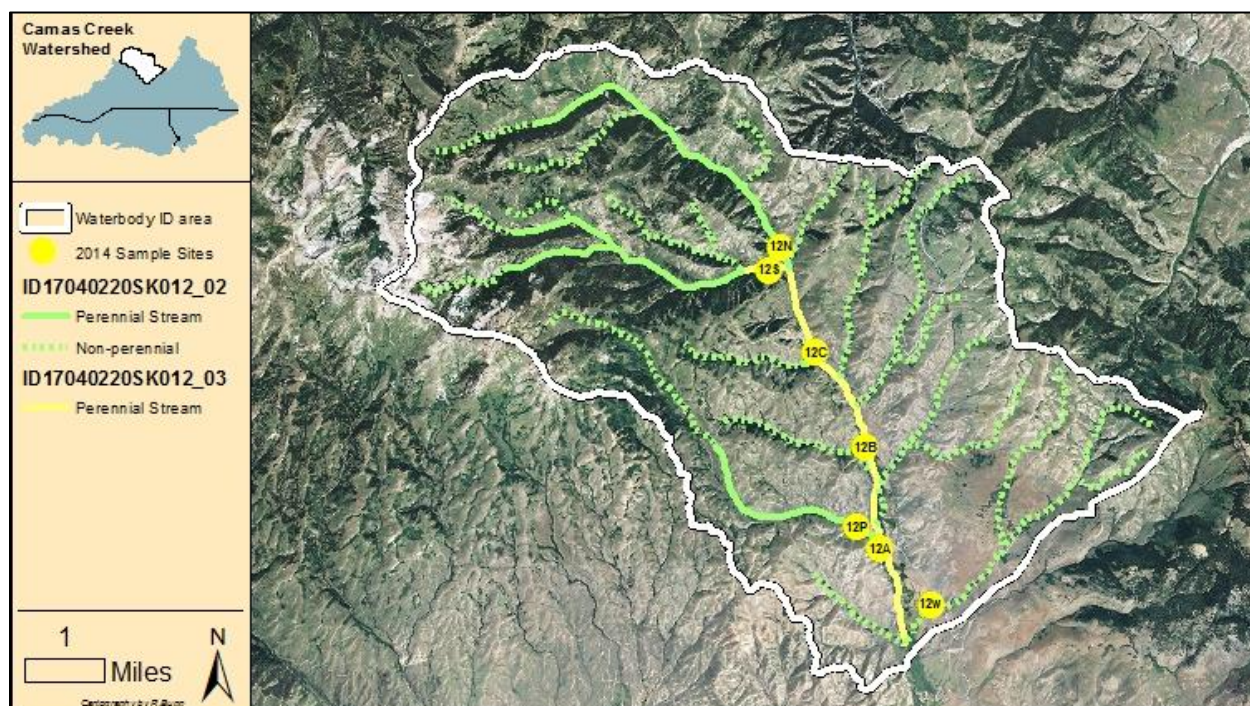


Figure 63. WBID US-12, Soldier Creek – source to and including Wardrop Creek.

2.4.12.1 Assessment Units

AU ID17040220SK012_02 includes the 1st- and 2nd-order tributaries contributing to the 3rd-order of Soldier Creek, totaling 60.87 miles. The 1st-order segments in this AU are ephemeral, mostly exhibiting flows in direct response to snowmelt and precipitation events. Three of the 2nd-order segments have perennial flows in some length of their channel: Phillips Creek, South Fork Soldier Creek, and North Fork Soldier Creek.

AU ID17040220SK012_03 is the 3rd-order of Soldier Creek. This perennial stream begins at the confluence of North Fork and South Fork and continues 6.53 miles to the start of WBID US-11, Soldier Creek (Table 81).

Table 81. Soldier Creek (US-12) assessment units.

Idaho's 2012 Integrated Report			AU	Stream Segment
Category 2: Full Support			ID17040220SK012_02	Soldier Creek – source to and including Wardrop Creek 60.87 MILES
			ID17040220SK012_03	Soldier Creek – source to and including Wardrop Creek 6.53 MILES
Beneficial Use	_02	_03	Causes	Reference
Cold water aquatic life	FS	FS		
Salmonid spawning	FS	FS		
Secondary contact recreation	FS	FS		
Agricultural water supply	NA	NA		
Industrial water supply	NA	NA		
Wildlife habitat	NA	NA		
Aesthetic	NA	NA		

Beneficial Use Comments**Salmonid Spawning**

ID17040220SK012_02 – 4/23/2012 (S. Woodhead). Changed salmonid spawning to an existing use. Fish data from BURP site 1995STWFA021 demonstrates evidence of salmonids less than 100mm (Idaho's WBAG II, page 3-9).

ID17040220SK012_03 – 4/23/2012 (S. Woodhead). Changed salmonid spawning to an existing use. Fish data from BURP site 2005STWFA006 demonstrates evidence of salmonids less than 100mm (Idaho's WBAG II, page 3-9).

AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	1995STWFA021	NF Soldier Creek	55.49	3.00	87.24	3.00	85.00	3.00	3.00
02	1995STWFB013	Owens Creek	30.81	0.00	—	—	70.00	3.00	0
02	2001STWFA015	NF Soldier Creek	82.38	3.00	—	—	67.00	3.00	3.00
02	2001STWFA016	Reedy Creek				—Dry—			
02	2001STWFA017	Owens Creek				—Dry—			
02	2001STWFA019	Lawrence Creek				—Dry—			
02	2001STWFA033	Wardrop Creek	62.31	3.00	—	—	51.00	1.00	2.00
02	2004STWFA040	Soldier Creek	84.37	3.00	—	—	68.00	3.00	3.00
02	2007STWFA051	Owens Creek				—Dry—			
02	2012STWFA057	NF Soldier Creek	83.86	3.00	93.29	3.00	61.00	2.00	2.67

AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	2014STWFA050	Wardrop Creek	—Dry—						
02	2014STWFA058	Cottonwood Creek	—Dry—						
02	2014STWFA099	Lawrence Creek	—Dry—						
02	2014STWFA100	Owens Creek	—Dry—						
03	1995SSCFA003	SF Soldier Creek	—	—	—	—	70.00	3.00	3.00
03	2001STWFA014	SF Soldier Creek	84.47	3.00	—	—	75.00	3.00	3.00
03	2004STWFA039	SF Soldier Creek	83.83	3.00	—	—	71.00	3.00	3.00
03	2005STWFF006	SF Soldier Creek	—	—	69.58	2.00	10.00	1.00	1.50
03	2007STWFA023	SF Soldier Creek	71.56	3.00	95.99	3.00	69.00	3.00	3.00
03	2007STWFA117	Soldier Creek	—Denied Access—						
03	2012STWFA001	Soldier Creek	75.24	3.00	89.48	3.00	66.00	3.00	3.00

2.4.12.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-12:

1. The gradient of the stream features in this WBID promote erosional stream characteristics. Downstream deposition occurs in the lower end of main stem Soldier Creek within WBID US-11.
2. ID17040220SK012_02 and _03 have active beaver complexes at several locations.
3. This WBID hosts the highest concentration of focused and developed recreation within the Camas Creek watershed. Facilities include USFS campgrounds, motorized and nonmotorized trails, paved and gravel roads, and the Soldier Mountain Ski Resort. Recreation occurs here year-round, as does residency at several homes and ranches (Figure 64 and Figure 65).
4. This WBID includes Wardrop Creek, which appears to be entirely diverted for irrigation on adjacent pastures just below the Soldier Creek Road crossing. Connection to Soldier Creek was not confirmed during the 2014 sampling effort.



Figure 64. Soldier Creek.



Figure 65. Recreation trail crossing on Soldier Creek.

Flow

Flows were measured for Soldier Creek at sampling location 17040220-12A at the Phillips Creek Road crossing. April and May provided the only measurements of significant discharge at 3.93 cfs and 2.00 cfs, respectively. Subsequent measurements in June and July required the use of a small portable V-notch flume to determine trace flows of 0.59 and 0.02 cfs. This sampling location was dry in August and September.

Flows were also measured on Wardrop Creek at the Soldier Creek Road crossing, sampling location 17040220-12W, as this stream is included in WBID US-12. Monitoring was conducted to assist in determining cumulative influence to downstream site 17040220-12A. Dry channel conditions beginning in July and continuing through the remainder of the sampling visits confirmed that Wardrop Creek is ephemeral (Figure 66).

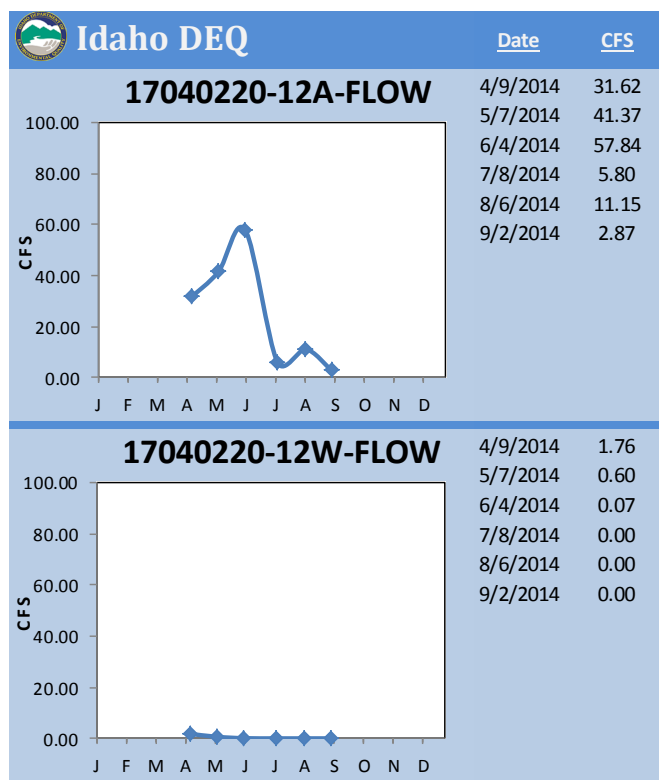


Figure 66. Flow at 17040220-12A and 17040220-12W, 2014.

Flow measurements for several Soldier Creek locations (Table 82) were collected on August 6 during a stratified sampling campaign. These flow proportions indicate that Soldier Creek is a losing reach downstream of the South and North Forks (12S, 12N) confluence.

Table 82. Soldier Creek (US-12) 8/6/2014 flows.

Site	Flow
12S	9.316
12N	4.632
12C	13.500
12B	12.640
12P	0.985
12A	11.150
12W	0.000

Past Conditions

The 2005 Camas TMDL did not specifically address the portions of Soldier Creek comprising AUs ID17040220SK012_02 or ID17040220SK012_03. The subbasin assessment generally describes that the upper portions of Soldier Creek (US-12) were supporting beneficial uses at that time.

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 67). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 83).



Figure 67. Sample site 17040220-12A, 8/6/2014 and 9/2/2014.

Table 83. Soldier Creek (US-12) water chemistry.

17040220-12A Soldier Creek										
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus		TSS		E. coli		Flow
	mg/L	mg/L	mg/L	mg/L		mg/L		MPN/100mL		ft³/sec
4/9/2014	<0.010	0.099	0.35	0.029		6.0		<1.0		31.62
5/7/2014	<0.010	0.059	0.39	0.026		8.5		2.0		41.37
6/4/2014	<0.010	0.011	0.28	0.026		7.0		14.6		57.84
7/8/2014	0.012	<0.010	0.29	0.042		<5.0		547.5		5.797
8/6/2014 ¹	<0.010	0.036	0.51	0.084		9.0		816.4		11.15
9/2/2014	<0.010	<0.010	0.30	0.066		<5.0		46.1		2.871
1. Currently raining which may be contributing to the noticeable mild turbidity instream.										
17040220-12W Wardrop Creek										
4/9/2014	<0.010	0.046	0.19	0.042		<5.0		<1.0		1.76
5/7/2014 ¹	<0.010	<0.010	0.30	0.034		<5.0		<1.0		0.598
6/4/2014	<0.010	<0.010	0.22	0.035		<5.0		30.9		0.071
7/8/2014	--	--	--	--		--		--		no flow
8/6/2014	--	--	--	--		--		--		dry
9/2/2014	--	--	--	--		--		--		dry
1. Wardrop Creek entirely diverted below culvert. All flow delivered for irrigation - no direct flow connection to Soldier Creek.										

A stratified sampling effort for this WBID occurred on 8/06/2014. Three Soldier Creek sites and four tributary sites were sampled on the same date to provide a watershed-wide view of conditions (Table 84). Active precipitation may have some influence on concentrations found during this effort.

Table 84. Soldier Creek (US-12) stratified sampling—8/06/2014.

17040220-12() Soldier Creek							
Sample Site 8/6/2014¹	Ammonia as N	Nitrogen, Nitrate- Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TSS	<i>E. coli</i>	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/ 100mL	ft ³ /sec
(N) NF Soldier	<0.010	0.083	0.340	0.053	16	579.4	4.632
(S) SF Soldier	<0.010	0.028	0.370	0.038	12	125.0	9.316
(C) Soldier	<0.010	0.040	0.360	0.056	17	410.6	13.50
(B) Soldier	<0.010	0.045	0.430	0.070	14	648.8	12.64
(P) Phillips	0.011	0.130	0.660	0.130	20	1986.3	0.985
(A) Soldier	<0.010	0.036	0.510	0.084	9	816.4	11.15
(W) Wardrop	--	--	--	--	--	--	dry

1. Raining today which may be contributing to the noticeable mild turbidity.

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-12A to represent nutrient discharge into downstream waters. This sample site is located on AU ID17040220SK012_03 at the Phillips Creek Road crossing. Nutrients specific to ID17040220SK012_02 were not reviewed in 2014.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 85). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 85. Soldier Creek (US-12) nutrient summary.

17040220-12A Soldier Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate- Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TP:TN Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	0.099	0.350	0.029	15.5	--	0.082
May	0.059	0.390	0.026	17.3	--	0.097
June	0.011	0.280	0.026	11.2	--	0.135
July	<0.010	0.290	0.042	7.1	N Limiting	0.022
August	0.036	0.510	0.084	6.5	N Limiting	0.084
September	<0.010	0.300	0.066	4.7	N Limiting	0.017

¹ TP:TN ratios -- Values > 16 = P Limiting Values < 10 = N Limiting

² (TP [mg/l] *0.08982555)Flow [ft3/sec] = TP load [lbs/day]

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-12A to represent TSS discharge into downstream waters. This sample site is located on AU ID17040220SK012_03 at the Phillips Creek Road crossing. TSS specific to ID17040220SK004_02 was not assessed in 2014. However, three samples were collected from Wardrop Creek at location 17040220-12W (Table 86). This site is at the Soldier Creek Road crossing and prior to flow diversion for irrigation. TSS at this location is likely to be representative of other 2nd-order ephemeral streams in this AU and was observed to be consistently low.

All samples in this WBID were determined to be less than 10 mg/L of TSS during the 2014 sampling effort, likely a result of low ratios of very fine particles in the granitic geology of this region. Also, active beaver complexes contribute to sediment retention throughout the system.

Table 86. Soldier Creek (US-12) total suspended solids.

17040220-12A Soldier Creek			
Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	6.0	31.620	3.11
May	8.5	41.37	5.76
June	7.0	57.84	6.64
July	<5.0	5.80	0.48
August	9.0	11.15	1.65
September	<5.0	2.87	0.24
17040220-12W Wardrop Creek			
April	<5.0	1.760	0.14
May	<5.0	0.60	0.05
June	<5.0	0.07	0.01
July	--	no flow	--
August	--	dry	--
September	--	dry	--
¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load			

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-12A and 17040220-12W are displayed in Table 87. Sample results from 17040220-12A indicate *E. coli* concentrations above trigger values during July and August.

Table 87. Soldier Creek (US-12) *E. coli*.

17040220-12A Soldier Creek Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/ 100mL	ft3/sec	
April	<1.0	31.62	--
May	2.0	41.37	--
June	14.6	57.84	--
July	547.5	5.80	PCR
August	816.4	11.15	PCR,SCR
September	46.1	2.87	--
17040220-12W Wardrop Creek			
April	<1.0	1.76	--
May	<1.0	0.60	--
June	30.9	0.07	--
July	--	dry	--
August	--	dry	--
September	--	dry	--
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Temperature

A thermograph was deployed in this water body to capture hourly water temperature measurements. The temperature plot for 7/03/2014–12/31/2014 is displayed in Figure 68. The plot indicates that AU ID17040220SK012_03 has a few exceedances of the instantaneous numeric criteria of 22 °C for the CWAL beneficial use as defined in IDAPA 58.01.02.250.02.b during the measurement period. However, many instantaneous exceedances were seen for the SS beneficial use criteria of 13 °C.



Figure 68. Soldier Creek (US-12) thermograph.

The exceedance analysis of this temperature data set confirmed instantaneous and average criteria exceedances for SS of 100% of measured days in the spring and 48% of measured days in the fall. The exceedance analysis summary is provided in Table 88, and the complete exceedance analysis is included Appendix A.

Table 88. Exceedances for site 17040220-12A, 7/03/2014–12/31/2014.

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prcnt	
22 °C Instantaneous	11	14%	
19 °C Average	0	0%	
Days Evaluated & Date Range	81	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prcnt	
13 °C Instantaneous Spring	13	100%	
9 °C Average Spring	13	100%	
Spring Days Eval'd w/in Dates	13	15-Apr	15-Jul
13 °C Instantaneous Fall	19	31%	
9 °C Average Fall	30	48%	
Fall Days Eval'd w/in Dates	62	15-Sep	15-Nov
13 °C Instantaneous Total *	32	43%	
9 °C Average Total *	43	57%	
Tot Days Eval'd w/in Both Dates *	75		

* If spring & fall dates overlap double counting may occur.

2.4.12.3 TMDL Targets, Loads, and Status

No TMDLs were developed for the AUs in this water body.

2.4.13 Camas Creek (US-13)

For an overview of this WBID, see Figure 69.

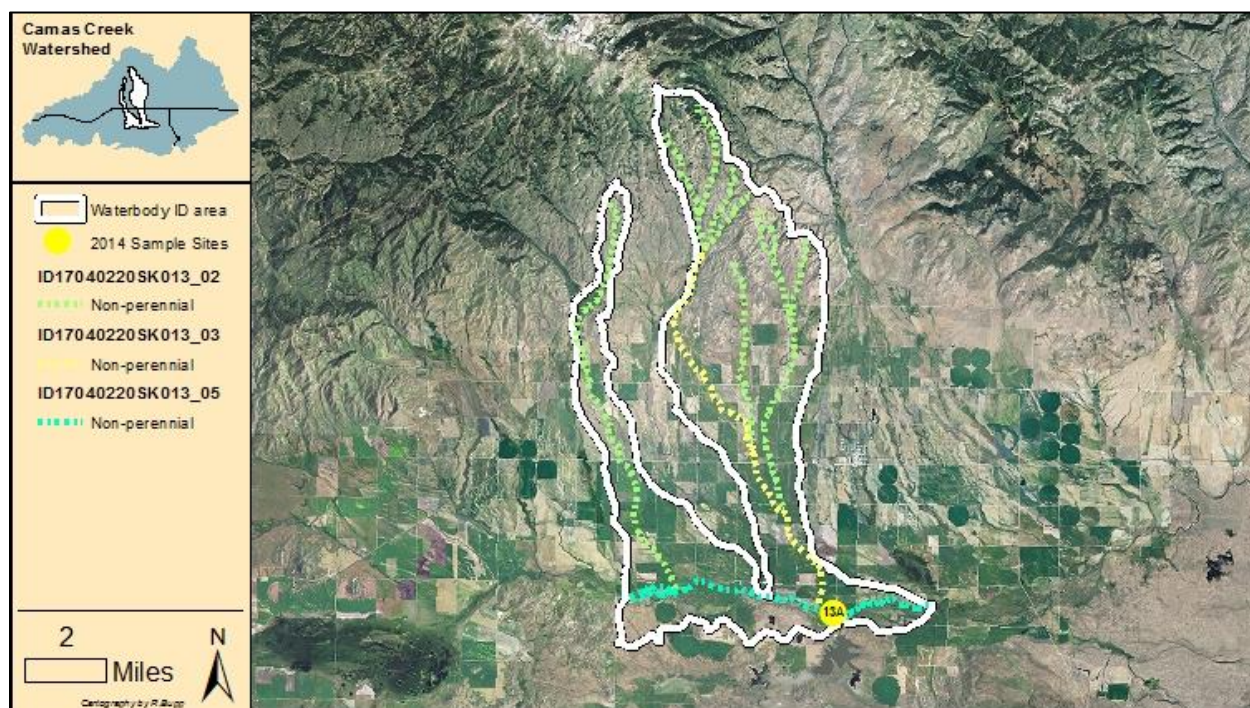


Figure 69. WBID US-13, Camas Creek – Corral Creek to Soldier Creek.

2.4.13.1 Assessment Units

AU ID17040220SK013_02 includes the 1st- and 2nd-order tributaries contributing to the 3rd-order of East Fork Threemile Creek and the 5th-order of Camas Creek, totaling 36.96 miles. Segments are ephemeral/episodic exhibiting flows only in direct response to snowmelt, precipitation events, or irrigation runoff.

AU ID17040220SK013_03 includes the 3rd-order of East Fork Threemile Creek and other 3rd-order tributaries contributing to the 5th-order of Camas Creek, with a total channel length of 11.43 miles. These segments are ephemeral, exhibiting flows only in direct response to snowmelt, ground water expression, or precipitation events.

AU ID17040220SK013_05 is the 5th-order of Camas Creek beginning at Corral Creek and ending at Soldier Creek for a total channel length of 10.39 miles. This segment is ephemeral, exhibiting flows only in direct response to snowmelt, ground water expression, or precipitation events (Table 89).

Table 89. Camas Creek (US-13) assessment units.

Idaho's 2012 Integrated Report				AU	Stream Segment				
Identified to have zero flow				ID17040220SK013_02	Unnamed tributaries to Camas Creek East Fork Threemile Creek Lansing Creek				
				ID17040220SK013_03	Unnamed tributaries to Camas Creek East Fork Threemile Creek				
				ID17040220SK013_02	Camas Creek – Corral Creek to Soldier Creek 36.96 MILES				
				ID17040220SK013_03	Camas Creek – Corral Creek to Soldier Creek 11.43 MILES				
Category 3: Unassessed Waters									
Category 4a: Impaired Waters with approved TMDLs				ID17040220SK013_05	Camas Creek – Corral Creek to Soldier Creek 10.39 MILES				
Beneficial Use		_02	_03	_05	Causes		Reference		
Cold water aquatic life		NA	NA	NS	Phosphorus (Total) Sedimentation/Siltation Temperature, water		ADB: 11/15/2004 TMDL (pg. 201): Lack of flow		
Salmonid spawning		NA	NA	NA					
Primary contact recreation		NA	NA	NA					
Agricultural water supply		NA	NA	NA					
Industrial water supply		NA	NA	NA					
Wildlife habitat		NA	NA	NA					
Aesthetic		NA	NA	NA					
AU order	BURP ID	Stream	SMI		SFI		SHI		Avg
			Score	Rtng	Score	Rtng	Score	Rtng	
02	2001STWFA034	McCan Gulch Creek							
02	2008STWFA049	Lansing Creek							
02	2010SDEQA138	Lansing Creek							
02	2011STWFA046	Lansing Creek							
02	2014STWFA042	Lansing Creek							
03	1996STWFB076	EF Threemile Creek							
03	2010SDEQA192	EF Threemile Creek							
03	2014STWFA040	EF Threemile Creek							
05	1993STWFA002	Camas Creek	—	—	—	—	6.00	1.00	1.00
05	1995STWFA017	Camas Creek	6.98	0.00	—	—	31.00	1.00	0.00
05	2001STWFA048	Camas Creek							

2.4.13.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-13 (Figure 70):

1. All stream segments comprising AUs ID17040220SK012_02, _03, and _05 are ephemeral.
2. Reduced flow following spring runoff is a result of losses to ground water.



Figure 70. Camas Creek (US-13) 6/10/2014.

Flow

Flows were measured for Camas Creek at sampling location 17040220-13A, upstream of the Mormon Reservoir Road crossing. The hydrograph indicates receding flows in April, which continued until no-flow conditions in early June. Subsequent observations through September confirmed a dry channel and ephemeral flow regime (Figure 71).

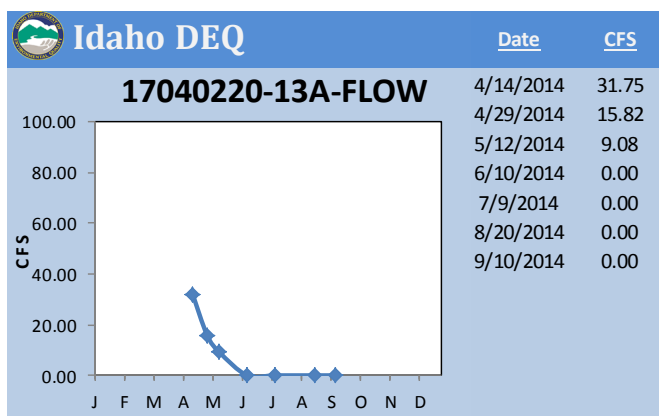


Figure 71. Flows at 17040220-13A, 2014.

Past Conditions

The 2005 Camas TMDL states the following in regard to the whole of Camas Creek:

Through the subbasin assessment process, it has been identified that the water quality and beneficial uses of Camas Creek are being impacted by pollutants. The pollutants of concern in the water body have been found to be sediment, nutrients, and temperature. Nutrients are a pollutant to Camas Creek as well as to Magic Reservoir the receiving water of Camas Creek...

...Lack of flow is the largest impact to beneficial uses of Camas Creek. (DEQ 2005, pg. 201)

Current Conditions

DEQ sampled this WBID from April 2014 through September 2014 (Figure 72). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 90).



Figure 72. Sample site 17040220-13A, 5/12/2014 and 8/20/2014.

Table 90. Camas Creek (US-13) water chemistry.

17040220-13A Camas Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TSS	<i>E. coli</i>	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100mL	ft ³ /sec
4/14/2014	<0.010	<0.010	0.82	0.066	<5.0	5.2	31.75
4/29/2014	--	--	--	--	--	--	15.82
5/12/2014	<0.010	<0.010	0.73	0.045	<5.0	4.1	9.075
6/10/2014	--	--	--	--	--	--	dry
7/9/2014	--	--	--	--	--	--	dry
8/20/2014	--	--	--	--	--	--	dry
9/10/2014	--	--	--	--	--	--	dry

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-13A to represent nutrient discharge into downstream waters. This sample site is located on AU ID17040220SK013_05 at the Mormon Reservoir Road crossing. Nutrients specific to ID17040220SK013_02 or _03 were not reviewed in 2014.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 91). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 91. Camas Creek (US-13) nutrient summary.

17040220-13A Camas Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate - Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TN:TP Ratio	Limits ¹	TP Load ²
	mg/L	mg/L	mg/L			lbs/day
April	<0.010	0.820	0.066	12.6	--	0.188
May	<0.010	<0.010	0.045	0.44	N Limiting	0.064
June	--	--	--	--	--	--
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--
¹ TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
² (TP [mg/l] *0.08982555)Flow [ft3/sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-13A to represent TSS discharge into downstream waters. This sample site is located on AU ID17040220SK013_05 at the Mormon Reservoir Road crossing. TSS specific to ID17040220SK013_02 or _03 were not reviewed in 2014. Both samples analyzed indicated TSS levels below detectable limits (Table 92).

Table 92. Camas Creek (US-13) total suspended solids.

17040220-13A Camas Creek Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	<5.0	31.750	2.60
May	<5.0	9.08	0.74
June	--	dry	--
July	--	dry	--
August	--	dry	--
September	--	dry	--
¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]			

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-13A are displayed in Table 93 and do not indicate any *E. coli* concentrations above trigger values.

Table 93. Camas Creek (US-13) *E. coli*.

17040220-13A Camas Creek Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/ 100mL	ft ³ /sec	
April	5.2	31.75	--
May	4.1	9.08	--
June	--	dry	--
July	--	dry	--
August	--	dry	--
September	--	dry	--
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Temperature

A thermograph was deployed in this water body to capture hourly water temperature measurements. The temperature plot for 4/30/2014–5/28/2014 is displayed in Figure 73. The plot indicates that AU ID17040220SK013_05 has exceedances of the instantaneous numeric criteria of 22 °C for the CWAL and 13 °C for SS beneficial uses during the measurement period. Further analysis of this temperature data set also identified daily average criteria exceedances for both CWAL and SS. The exceedance analysis summary is displayed in Table 94. A complete exceedance analysis is in Appendix A.

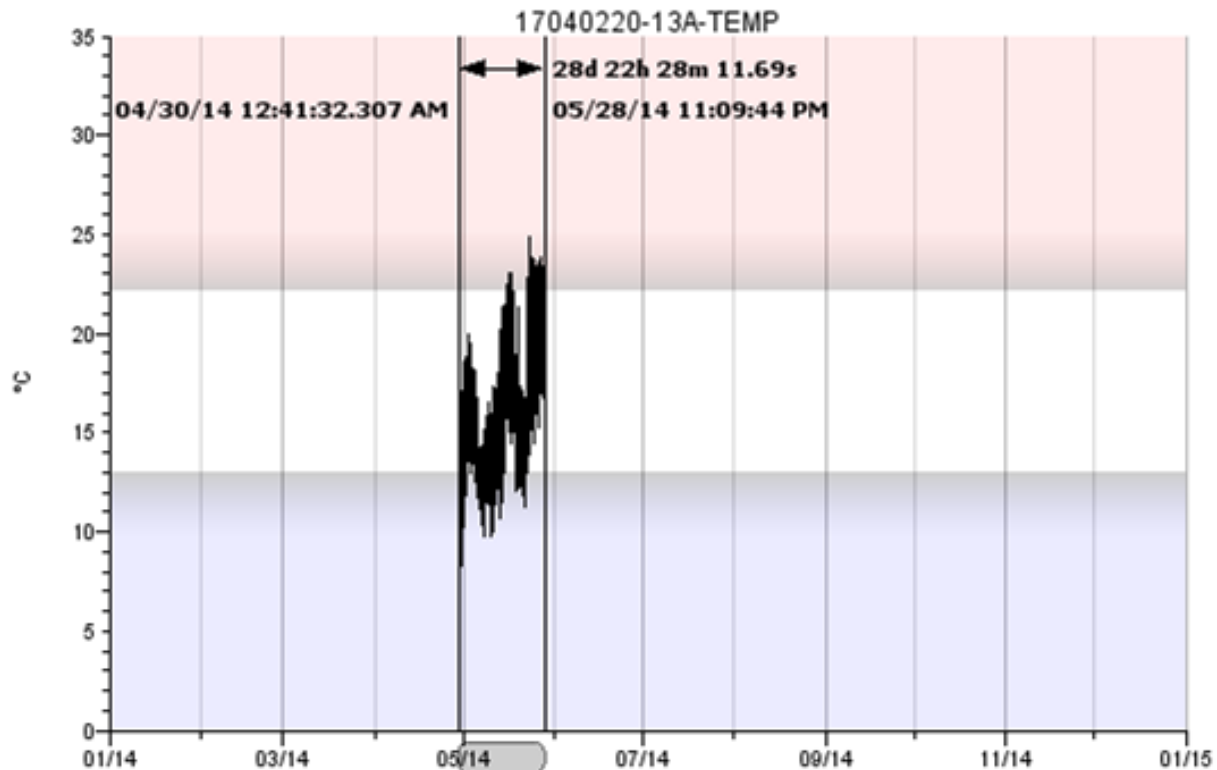


Figure 73. Camas Creek (US-13) thermograph.

Table 94. Exceedances for site 17040220-13A, 4/30/2014–5/28/2014.

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prct	
22 °C Instantaneous	10	34%	
19 °C Average	5	17%	
Days Evaluated & Date Range	29	1-Jan	31-Dec

Idaho Salmonid Spawning Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prct	
13 °C Instantaneous Spring	29	100%	
9 °C Average Spring	29	100%	
Spring Days Eval'd w/in Dates	29	15-Apr	15-Jul
13 °C Instantaneous Fall	0	0%	
9 °C Average Fall	0	0%	
Fall Days Eval'd w/in Dates	0	15-Sep	15-Nov
13 °C Instantaneous Total *	29	100%	
9 °C Average Total *	29	100%	
Tot Days Eval'd w/in Both Dates *	29		

* If spring & fall dates overlap double counting may occur.

2.4.13.3 TMDL Targets, Loads, and Status

The 2005 Camas TMDL set pollutant load targets for the primary Camas Creek channel as a whole. Loads specific to AUs ID17040220SK013_02, SK013_03, and SK013_05 were not prescribed individually. Interpolated past load, current load, and current status are displayed in Table 95.

Table 95. Camas Creek (US-13) TMDL load summary and status.

AU	TMDL Pollutant	2005 Load ^a	2014 Loads ^b	TMDL Target ^c	Target Status ^d
ID17040220SK013_02	— No TMDL —				
ID17040220SK013_03	— No TMDL —				
ID17040220SK013_05 ^e	Nutrients (lb/day TP)	130.49	0.066	Load capacity 61.55 lb/day	Target achieved
			0.045	Max. conc. 0.050 mg/L	Target exceeded
	Sediment (t/yr)	8,018.8 ^f	<5.0	Load capacity 512.6 t/yr	Target achieved.
			<5.0	80% bank stability	Status unknown
	Temperature Solar Load ^g (kWh/day)		1,705,000	1,479,000 kWh/day	Target exceeded
			Varied segment % deficiencies	Shade % per segment	Target exceeded
<p>a. Loads identified in the 2005 Camas TMDL pgs. 201–205.</p> <p>b. Calculated from 2014 sampling results.</p> <p>c. TMDL targets prescribed in the 2005 Camas TMDL pgs. 201–205.</p> <p>d. Target status determined as described in this section's narrative.</p> <p>e. 2005 TMDL combined all Camas Creek AUs in load analysis and target prescription.</p> <p>f. The 2005 sediment load was calculated with erosion rate, bank height, and quantity of streambank stability.</p> <p>g. Target status determined as described in the draft 2016 Camas Creek temperature PNV analysis.</p>					

Sediment TMDL

The 2005 Camas TMDL states the following:

Sediment is impacting beneficial uses of Camas Creek in the form of bed load sediment. Suspended sediment measured during drought years is not impacting water quality of the stream, however bed load sediment measured in the form of percent fines indicates that sediment is impacting water quality. A value greater than 35% for percent fines was used to indicate that sediment was impacting the water body. If this was the case then stream bank erosion inventories were completed to determine if stream bank erosion was the contributor of sediment impact. The target for stream bank erosion TMDLs is 80% bank stability. (DEQ 2005)

Sampling in 2014 included analysis for TSS and yielded instantaneous loads as displayed in Table 92. Existing TSS loads are significantly lower than the sediment load identified in the 2005 Camas TMDL (8,018.8 tons/year). Although these numbers cannot be compared directly, the TSS numbers do show that the water column loads in this AU are responsive to flow and are relatively low.

A walking bank stability inspection was not performed in 2014 due to lack of access to private property.

Nutrient TMDL

The 2005 Camas TMDL states the following:

Nutrients are impacting the CWAL beneficial uses of Camas Creek, but as the creek discharges into a reservoir the TMDL is completed to limit nutrient delivery to the reservoir. The target for water bodies discharging into a storage system is 0.050 mg/L. This goal should aid limiting excessive delivery of nutrients to the reservoir. As a result 0.050 mg/L is the target to be used in the development of a nutrient TMDL for Camas Creek. (DEQ 2005)

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. To review the performance of the TMDL, instantaneous daily loads for TP have been calculated for each sample event (Table 96). These daily loads are significantly lower than the load capacity recorded in the TMDL (61.55 lb/day) although the concentration was higher in the early spring than the TMDL maximum of 0.050 mg/L. For these reasons, the TP loads are far below the daily load capacity in Camas Creek but may exceed the target TMDL concentration.

Table 96. Camas Creek (US-13) total phosphorus loads.

US-13; Camas Creek			
Total Phosphorus Load			
Sample Month	TP	Flow	TP Load¹
	mg/L	cfs	tons/year
April	0.066	31.750	0.188
May	0.045	9.075	0.064
June	--	dry	--
July	--	dry	--
August	--	dry	--
September	--	dry	--

¹ (TP [mg/L] *0.08982555)Flow [cfs] = TP load [lbs/day]

Temperature TMDL

A PNV analysis was completed for this water body in 2016 to re-evaluate segment shade targets and heat loading. As a result, a new total solar load target was set at 1,479,000 kWh/day for AU ID17040220SK013_05 (Table 97).

The existing shade for each segment was found to vary. Some segments meet or exceed the shade potential, and some segments are shade deficient. The calculated existing heat load based on existing shade is 1,705,000 kWh/day for SK013_05.

Based on the 2016 PNV shade analysis, thermograph data set, and discharge measurements from site 17040220-13A, the following conclusions are drawn for water temperature:

- AU ID17040220SK013_05 is exceeding the heat loading target prescribed in the 2016 Camas PNV analysis.
- AU ID17040220SK013_05 exceeded the average criteria for SS on 100% of the sampled days. Salmonid spawning has not been assessed for this AU.
- Both the PNV shade analysis and temperature exceedance analysis indicate temperature impairment; however, the condition of greatest impairment to the beneficial uses in this AU appears to be the ephemeral (dry) regime, rather than solar loading.

Table 97. Camas Creek (US-13) heat load summary.

US-13; Camas Creek PNV Temperature Loads¹			
AU	Target	Existing	Excess
	kWh/day	kWh/day	kWh/day
013_05	1,479,000	1,705,000	226,000

¹ Solar loading from 2016 PNV Temperature TMDL.

2.4.14 Threemile Creek (US-14)

For an overview of this WBID, see Figure 74.

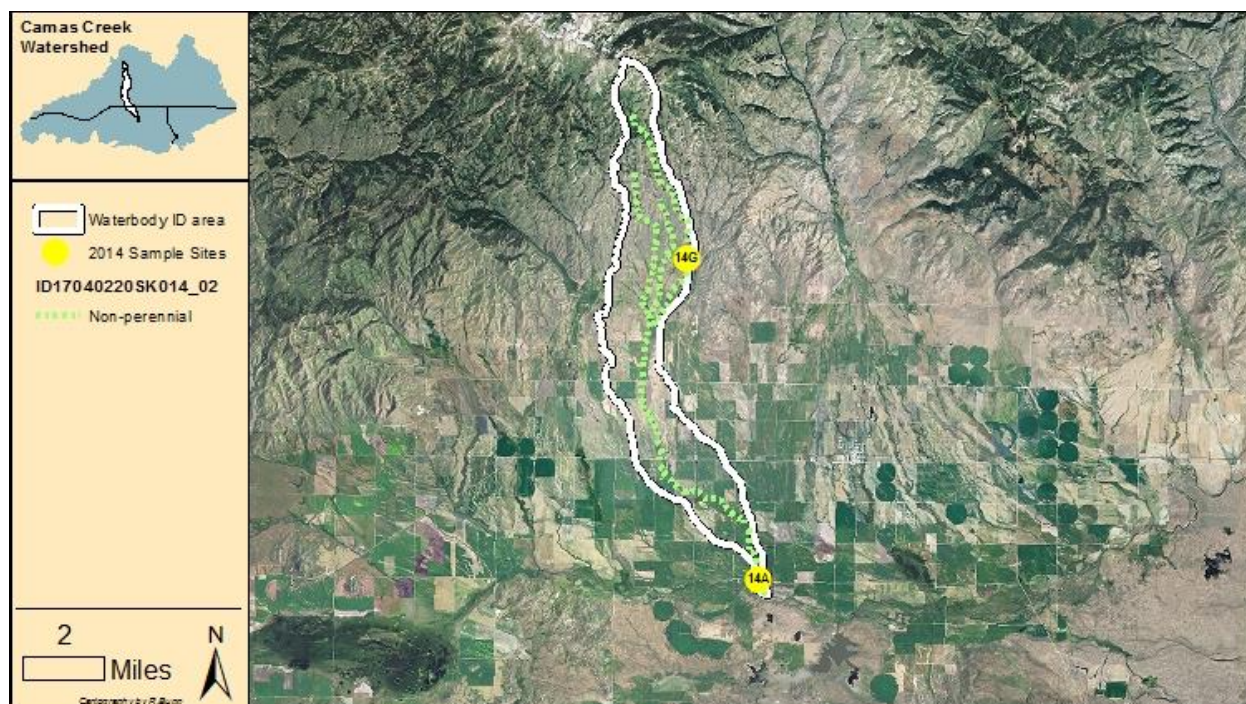


Figure 74. WBID US-14, Threemile Creek – source to mouth.

2.4.14.1 Assessment Units

AU ID17040220SK014_02 includes the 1st- and 2nd-order tributaries contributing to the 5th-order of Camas Creek, totaling 21.75 miles. Segments are ephemeral, flowing in direct response to snowmelt and precipitation events (Table 98).

Table 98. Threemile Creek (US-14) assessment unit.

Idaho's 2012 Integrated Report			AU		Stream Segment				
Identified to have zero flow			ID17040220SK014_02		McMahan Creek Threemile Creek West Fork Threemile Creek.				
Category 3: Unassessed Waters			ID17040220SK014_02		Threemile Creek – source to mouth 21.75 MILES				
Beneficial Use		_02	_03	Causes			Reference		
Cold water aquatic life		NA	NA						
Secondary contact recreation		NA	NA						
Agricultural water supply		NA	NA						
Industrial water supply		NA	NA						
Wildlife habitat		NA	NA						
Aesthetic		NA	NA						
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtnng	Score	Rtnng	Score	Rtnng	
02	1996STWFB074	Threemile Creek							—Dry—
02	1996STWFB075	Threemile Creek							—Dry—
02	2001STWFA035	West Fork Threemile Creek							—Dry—
02	2001STWFA036	McMahan Creek							—Dry—
02	2001STWFA043	Threemile Creek							—Dry—
02	2001STWFA078	Threemile Creek							—Dry—
02	2004STWFA076	Threemile Creek							—Dry—
02	2011STWFA045	Threemile Creek							—Dry—
02	2014STWFA041	Threemile Creek							—Dry—

2.4.14.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified these factors that drive the water quality conditions within WBID US-14:

1. WBID US-14 is a small basin on the south toe of Smoky Dome mountain with a 2nd-order main channel (Threemile Creek). This heavily vegetated channel connects to Camas Creek southward across the Camas Prairie (Figure 75). The Soldier Mountain Resort and Golf Course is in the upper extent of this drainage.

2. AU ID17040220SK014_02 is ephemeral, flowing in direct response to snowmelt and precipitation.



Figure 75. Vegetated channel of Threemile Creek.

Flow

Flows were measured for Threemile Creek at sampling location 17040220-14A in April and May. This site is at the Manard Road crossing upstream from the confluence with Camas Creek. Threemile Creek was flowing in April (1.71 cfs) and May (0.87 cfs) only. Subsequent visits yielded a dry channel (Figure 76).

An additional flow was measured at location 17040220-14G in June (0.74 cfs). This location is at the Threemile Creek Road crossing adjacent to Soldier Mountain Resort. Subsequent visits yielded a dry channel.

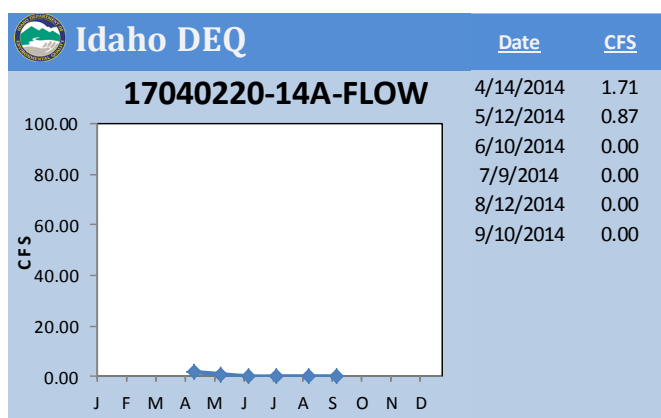


Figure 76. Flows at 17040220-14A, 2014.

Past Conditions

The 2005 Camas TMDL did not disclose any information specific to the water quality or beneficial uses for US-14, Threemile Creek.

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 77). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 99).



Figure 77. Sample site 17040220-14A, 5/12/2014 and 7/09/2014.

Table 99. Threemile Creek (US-14) water chemistry.

Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TSS	<i>E. coli</i>	Flow
	mg/L	mg/L	mg/L	mg/L		MPN/100mL	
4/14/2014	<0.010	<0.010	0.54	0.051	<5.0	1.0	1.714
5/12/2014	<0.010	<0.010	0.68	0.042	<5.0	6.3	0.866
6/10/2014	--	--	--	--	--	--	dry
7/9/2014	--	--	--	--	--	--	dry
8/12/2014	--	--	--	--	--	--	dry
9/10/2014	--	--	--	--	--	--	dry
17040220-14G Threemile Creek							
6/10/2014	<0.010	<0.010	0.23	0.033	<5.0	141.4	0.736
7/9/2014	--	--	--	--	--	--	dry
8/12/2014	--	--	--	--	--	--	dry

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-14A to represent nutrient discharge into downstream waters and at 17040220-14G in June. Sample site 14A is located on Threemile Creek at the Manard Road crossing, and 14G is adjacent to Soldier Mountain Resort.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 100). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 100. Threemile Creek (US-14) nutrient summary.

17040220-14A Threemile Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TN:TP Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	<0.010	0.540	0.051	10.8	--	0.008
May	<0.010	0.680	0.042	16.4	P Limiting	0.003
June (14G)	<0.010	0.230	0.033	7.3	N Limiting	0.002
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--
1 TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
2 (TP [mg/L] *0.08982555)Flow [cfs] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS (Table 101). Samples were collected at location 17040220-14A to represent TSS discharge into downstream waters and 17040220-14G when the lower channel was dry.

Table 101. Threemile Creek (US-14) total suspended solids.

17040220-14A Threemile Creek			
Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	<5.0	1.714	0.14
May	<5.0	0.866	0.07
June (14G)	<5.0	0.736	0.06
July	--	dry	--
August	--	dry	--
September	--	dry	--
1 (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]			

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-14A and 14G are displayed in Table 102 and do not indicate any *E. coli* concentrations above trigger values.

Table 102. Threemile Creek (US-14) *E. coli*.

17040220-14A Threemile Creek			
Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/100mL	ft3/sec	
April	1.0	1.71	--
May	6.3	0.866	--
June (14G)	141.4	0.736	--
July	--	dry	--
August	--	dry	--
September	--	dry	--
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Temperature

No historic or current temperature data exist for US-14, Threemile Creek.

2.4.14.3 TMDL Targets, Loads, and Status

No TMDLs were developed for the AU in this water body.

2.4.15 Corral Creek (US-15)

For an overview of this WBID, see Figure 78.

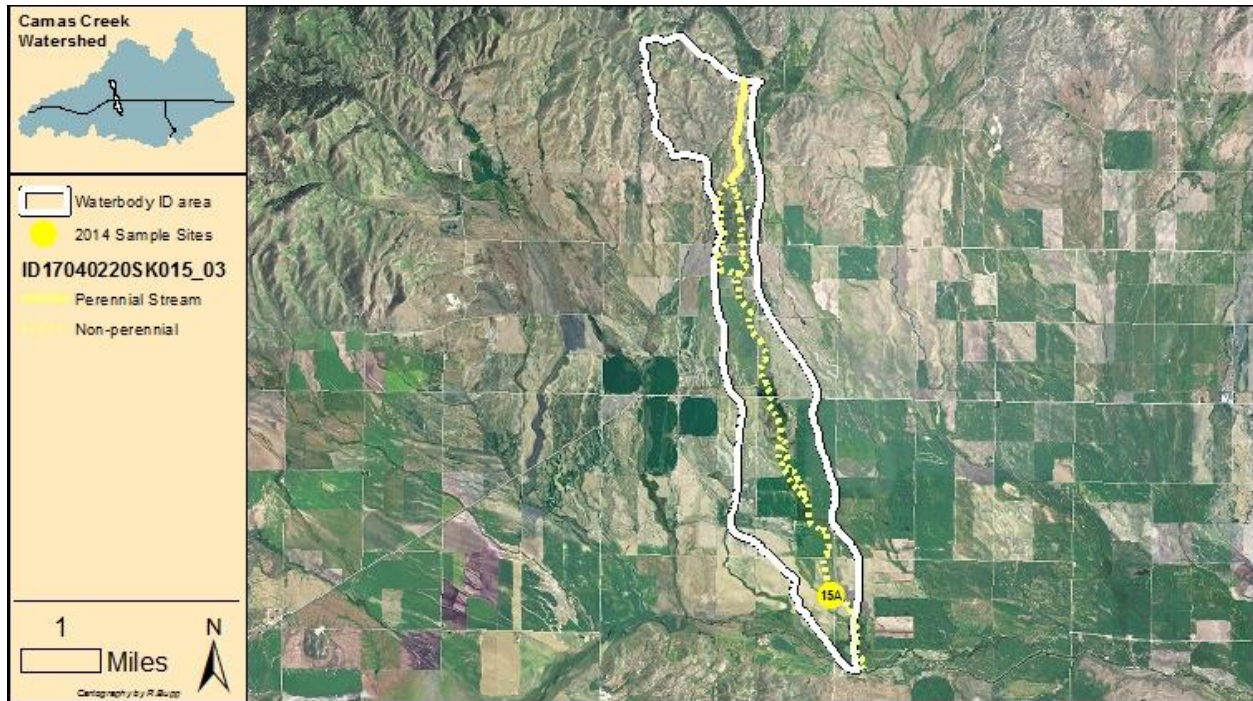


Figure 78. WBID US-15, Corral Creek – confluence of East Fork and West Fork Corral Creeks to mouth.

2.4.15.1 Assessment Units

AU ID17040220SK015_03 is the 3rd-order of Corral Creek, which begins at the confluence of the East Fork and West Forks of Corral Creek and continues 10.63 miles to Camas Creek. This segment is ephemeral, as the surface flow ceases midsummer (Table 103).

Table 103. Corral Creek (US-15) assessment unit.

Idaho's 2012 Integrated Report			AU		Stream Segment					
Category 4a: Impaired Waters with approved TMDLs			ID17040220SK015_03			Corral Creek – confluence of East Fork and West Fork Corral 10.63 MILES				
Beneficial Use		_03	Causes			Reference				
Cold water aquatic life		NS	Sedimentation/Siltation Temperature, water			ADB: Not identified TMDL (pgs. 182–186) Erosion, Lack of shade.				
Secondary contact recreation		NA								
Agricultural water supply		NA								
Industrial water supply		NA								
Wildlife habitat		NA								
Aesthetic		NA								
AU order	BURP ID	Stream	SMI		SFI		SHI		Average	
			Score	Rtng	Score	Rtng	Score	Rtng		
03	1993STWFA005	Corral Creek	13.14	0.00	—	—	10.00	1.00	0.00	
03	2007STWFA114	Corral Creek	—Dry—							
03	2011STWFA047	Corral Creek	—No Access—							
03	2014STWFA043	Corral Creek	—Dry—							

2.4.15.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-15:

1. AU ID17040220SK015_03 is ephemeral (Figure 79).
2. AU ID17040220SK015_03 exists entirely on the Corral Creek alluvial fan. This AU is a losing reach; flows infiltrate rapidly to ground water.
3. Irrigation diversion occurs at the extreme upper end of this AU for use in the surrounding pastures and contributes to the lack of water downstream later in the summer.



Figure 79. Corral Creek (US-15), 7/09/2014.

Flow

Flows were measured for Corral Creek at sampling location 17040220-15A. This site is at the Barron Road crossing. Two measurements in April and one in May showed significant discharge at 21.90 cfs, 12.00 cfs, and 8.91 cfs, respectively. A trace flow was measure in June at 0.80 cfs. Visits in July, August, and September yielded zero-flow conditions (Figure 80). Water was maintained in a small pool below the culvert late into the summer. This appeared to be an expression of the local shallow water table.

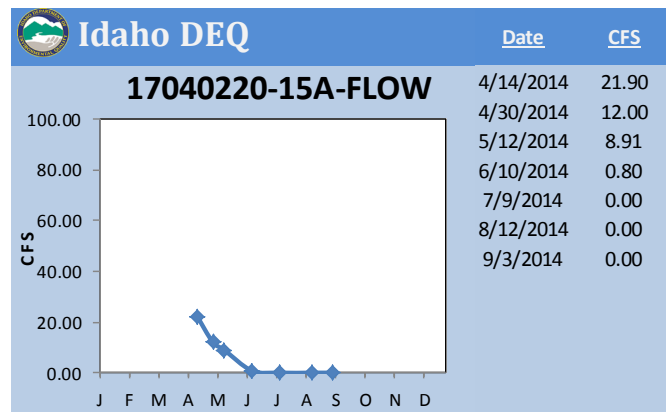


Figure 80. Flows at 17040220-15A, 2014.

Past Conditions

The 2005 Camas TMDL found that sediment and temperature were the pollutants of concern in Corral Creek and that lack of flow was the largest impact to beneficial uses (DEQ 2005, pg. 182).

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 81). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E.*

coli. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 104).



Figure 81. Sample site 17040220-15A, 4/09/2014 and 9/03/2014.

Table 104. Corral Creek (US-15) water chemistry.

17040220-15A Corral Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TSS	<i>E. coli</i>	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100mL	ft ³ /sec
4/14/2014	<0.010	<0.010	0.54	0.046	<5.0	17.9	21.90
4/30/2014	--	--	--	--	--	--	12.00
5/12/2014	<0.010	<0.010	0.53	0.055	<5.0	17.3	8.910
6/10/2014	<0.010	<0.010	0.87	0.14	<5.0	19.9	0.801
7/9/2014	--	--	--	--	--	--	dry
8/12/2014 ¹	--	--	--	--	--	--	dry
9/3/2014	--	--	--	--	--	--	dry

1. No evidence of flow recently despite flooding observed on upstream tributaries.

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-15A to represent nutrient discharge into downstream waters. This sample site is located on AU ID17040220SK015_03 at the Barron Road crossing.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 105). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 105. Corral Creek (US-15) nutrient summary.

17040220-15A Corral Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TN:TP Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	<0.010	0.540	0.046	12.0	--	0.090
May	<0.010	0.530	0.055	9.8	N Limiting	0.044
June	<0.010	0.870	0.140	6.3	N Limiting	0.010
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--
¹ TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting ² (TP [mg/l] *0.08982555)Flow [ft3/sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-15A to represent TSS discharge into downstream waters.

All 2014 samples for this water body were at levels less than detectable limits for TSS (Table 106).

Table 106. Corral Creek (US-15) total suspended solids.

17040220-15A Corral Creek			
Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	<5.0	21.90	1.80
May	<5.0	8.910	0.73
June	<5.0	0.801	0.07
July	--	dry	--
August	--	dry	--
September	--	dry	--
¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]			

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-15A are displayed in Table 107 and do not indicate any *E. coli* concentrations above trigger values.

Table 107. Corral Creek (US-15) *E. coli*.

17040220-15A Corral Creek			
Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/100mL	ft ³ /sec	
April	17.9	21.90	--
May	17.3	8.91	--
June	19.9	0.80	--
July	--	dry	--
August	--	dry	--
September	--	dry	--

¹ > 406cfu/100ml for Primary Contact Recreation
> 576 cfu/100ml for Secondary Contact Recreation

Temperature

A thermograph was deployed in this water body to capture hourly water temperature measurements. The temperature plot for 5/01/2014–7/01/2014 is displayed in Figure 82. The plot indicates that AU ID17040220SK015_03 has zero exceedances of the instantaneous numeric criteria of 22 °C for the CWAL beneficial use as defined in IDAPA 58.01.02.250.02.b during the measurement period.

**Figure 82. Corral Creek (US-15) thermograph.**

An exceedance analysis of the 17040220-15A temperature data set was completed. There were no exceedances of the instantaneous temperature criteria or daily average temperature criteria for CWAL.

2.4.15.3 TMDL Targets, Loads, and Status

The 2005 Camas TMDL set sediment and heat load targets for US-15, Corral Creek. Past load, current load, and current status are displayed in Table 108.

Table 108. Corral Creek (US-15) TMDL load summary and status.

AU	TMDL Pollutant	2005 Load ^a	2014 Load ^b	TMDL Target ^c	Target Status ^d
ID17040220SK015_03 ^e	Sediment (t/yr)	121.5 ^f	<5.0	Load capacity 35.8 t/yr	Target achieved.
			<5.0	80% bank stability	Status unknown
	Temperature Solar Load ^g (kWh/day)		470,000	310,000 kWh/day	Target exceeded
			Varied segment % deficiencies	Shade % per segment	Target exceeded
a. Loads identified in the 2005 Camas TMDL pgs. 201–205. b. Calculated from 2014 sampling results. c. TMDL targets prescribed in the 2005 Camas TMDL pgs. 201-205 d. Target status determined as described in this section’s narrative. e. 2005 TMDL combined all Camas Creek AU’s in load analysis and target prescription. f. The 2005 sediment load was calculated with erosion rate, bank height, and quantity of streambank stability. g. Target status determined as described in the draft 2016 Camas Creek temperature PNV analysis.					

Sediment TMDL

The 2005 Camas TMDL states the following:

Sediment is impacting beneficial uses of Corral Creek in the form of bed load sediment. Suspended sediment measured during drought years is not impacting water quality of the stream, however bed load sediment measured in the form of percent fines indicates that sediment is impacting water quality. A value greater than 35% for percent fines was used to indicate that sediment was impacting the water body. If this was the case then stream bank erosion inventories were completed to determine if stream bank erosion was the contributor of sediment impact. The target for stream bank erosion TMDLs is 80% bank stability. (DEQ 2005)

Sampling in 2014 included analysis for TSS and yielded instantaneous loads as displayed in Table 106. Existing TSS loads are significantly lower than the sediment target load identified in the 2005 Camas TMDL (35.8 tons/year). Although these numbers cannot be compared directly, the TSS numbers do show that the water column loads in this AU are responsive to flow and are relatively low.

No recent BURP assessments have been completed to include habitat (e.g., percent fines) evaluation because of the ephemeral flow regime. The WBAG is limited to perennial, wadeable

and nonwadeable lotic waterbodies only (Grafe et al. 2002). This methodology is not intended to evaluate beneficial use support in nonperennial water bodies such as Corral Creek.

It is probable that the percent fines identified in 1993STWFA005 (Table 109) were a result of this stream's ephemeral flow conditions and depositional fluvial characteristic, rather than indicating an anthropogenic pollutant.

Table 109. BURP site 1993STWFA005 sediment results.

% Fines			
	Wet Fines/Wet Total	Dry Fines/Dry Total	All Fines/All Total
Silt/Sand (≤ 2.5 mm)	94.59%	0.00%	94.59%
Silt/Sand/YFP (≤ 6 mm)	94.98%	0.00%	94.98%

Temperature TMDL

A PNV analysis was completed for this water body in 2016 to re-evaluate segment shade targets and heat loading. As a result, a new total solar load target is set at 310,000 kWh/day for AU SK015_03 (Table 110).

The existing shade for each segment was found to vary. Some segments meet or exceed the shade potential, and some segments are shade deficient. The calculated existing heat load based on existing shade is 470,000 kWh/day for SK015_03.

Based on the 2016 PNV shade analysis, thermograph data set, and discharge measurements from site 17040220-15A, the following conclusions are drawn for water temperature:

- ID17040220SK015_03 is exceeding the heat loading target prescribed in the 2016 Camas PNV analysis.
- ID17040220SK015_03 meets the CWAL temperature criteria when this AU is flowing.

Table 110. Corral Creek (US-15) heat load summary.

US-15; Corral Creek PNV Temperature Loads ¹			
AU	Target	Existing	Excess
	kWh/day	kWh/day	kWh/day
015_03	310,000	470,000	160,000

¹ Solar loading from 2016 PNV Temperature TMDL.

2.4.16 East Fork Corral Creek – Source to Mouth (US-16)

For an overview of this WBID, see Figure 83.

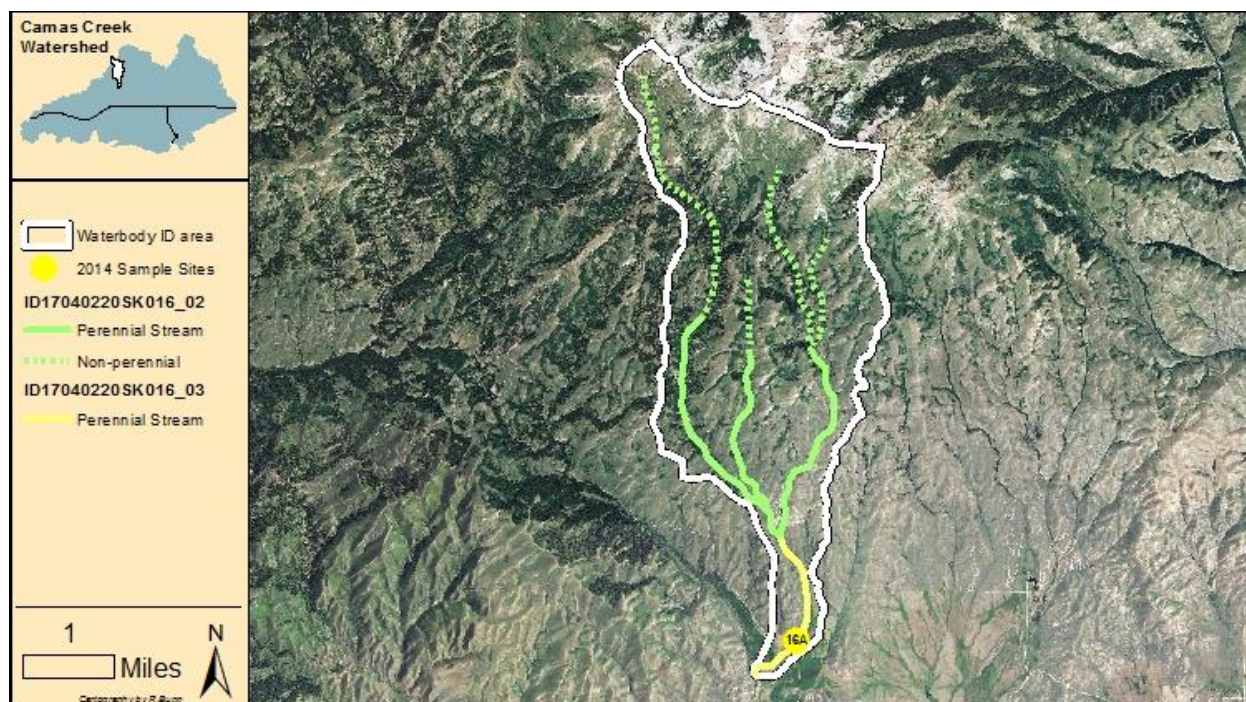


Figure 83. WBID US-16, East Fork Corral Creek – source to mouth.

2.4.16.1 Assessment Units

AU ID17040220SK016_02 includes the 1st- and 2nd-order tributaries contributing to the 3rd-order of East Fork Corral Creek, totaling 14.59 miles. Most channels in this AU are ephemeral but may exhibit perennial characteristics depending on depth of snowpack and spring flow duration.

AU ID17040220SK016_03 is a 3rd-order channel of East Fork Corral Creek totaling 1.9 miles. Flow is perennial, being influenced early by snowmelt then later by gains from ground water and local precipitation (Table 111).

Table 111. East Fork Corral Creek (US-16) assessment units.

Idaho's 2012 Integrated Report				AU		Stream Segment			
Category 2: Full Support				ID17040220SK016_02		East Fork Corral Creek – source to mouth 14.59 MILES			
Category 3: Unassessed Waters				ID17040220SK016_03		East Fork Corral Creek – source to mouth 1.9 MILES			
Beneficial Use		_02	_03	Causes			Reference		
Cold water aquatic life		FS	—						
Secondary contact recreation		FS	—						
Agricultural water supply		NA	NA						
Industrial water supply		NA	NA						
Wildlife habitat		NA	NA						
Aesthetic		NA	NA						
NA = Not Assessed, FS = Fully Supporting									
AU order	Assessment ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	1993STWFA014	Rough Creek	34.49	1.00	—	—	26.00	1.00	1.00
02	1994STWFA046	Rough Creek	—	—	60.00	1.00	—	—	1.00
02	1996STWFB040	EF Corral Creek	78.06	3.00	68.19	2.00	73.00	3.00	2.67
02	2013SDEQA528	Rough Creek	—Dry—						

2.4.16.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified these factors that drive the water quality conditions within WBID US-16:

1. The 2013 McCan Fire occurred partially in this water body. Influences from this fire were obvious in 2014 in the form of sediment mobility and mass wasting during precipitation events (Figure 84).
2. Flows in reaches of AU ID17040220SK014_02 are directly influenced by snowmelt and precipitation. Portions of Rough Creek may be ephemeral; this condition remains unconfirmed.



Figure 84. East Fork Corral Creek (US-16)—evidence of out-of-bank flood event including sediment deposition, 8/12/2014.

Flow

Flows were measured on East Fork Corral Creek at sampling location 17040220-16A. This site is at the Corral Creek Road crossing. Measurable flows persisted through the 2014 sampling season (Figure 85).

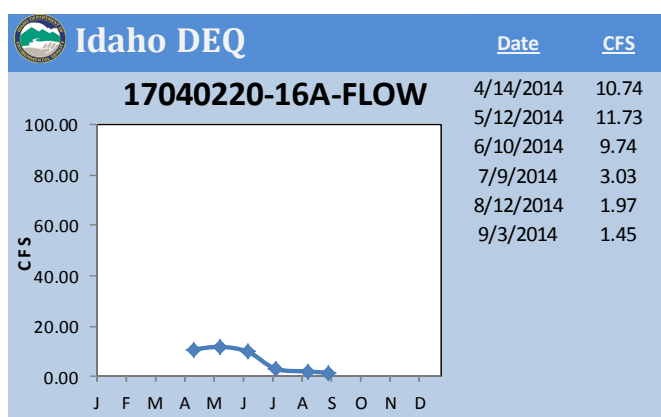


Figure 85. Flows at 17040220-16A, 2014.

Past Conditions

The 2005 Camas TMDL did not disclose any information specific to the water quality or beneficial uses for US-16, East Fork Corral Creek.

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 86). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 112).



Figure 86. Sample site 17040220-16A, 6/10/2014 and 9/03/2014.

Table 112. East Fork Corral Creek (US-16) water chemistry.

17040220-16A East Fork Corral Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TSS	<i>E. coli</i>	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100mL	ft ³ /sec
4/14/2014	<0.010	0.46	0.40	0.062	10	2.0	10.74
5/12/2014	<0.010	0.029	0.39	0.038	<5.0	2.0	11.73
6/10/2014	<0.010	0.018	0.22	0.047	7.5	36.4	9.738
7/9/2014	0.017	0.025	0.24	0.072	6.5	125.0	3.028
8/12/2014 ¹	0.34	0.08	2.70	1.000	220	488.4	1.973
9/3/2014 ²	0.071	0.16	2.50	0.860	250	135.0	1.453
1. Evidence of extreme high water/flooding. Culvert appears to have been blown out and has been replaced. High sediment indicates upstream debris flows.							
2. Water very turbid; debris flows may be occurring upstream.							

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-16A to represent nutrient discharge into downstream waters. This site is at the Corral Creek Road crossing, upstream of the culvert.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 113). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 113. East Fork Corral Creek (US-16) nutrient summary.

17040220-16A East Fork Corral Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TN:TP Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	0.460	0.400	0.062	13.9	--	0.060
May	0.029	0.390	0.038	11.0	--	0.040
June	0.018	0.220	0.047	5.1	N Limiting	0.041
July	0.025	0.240	0.072	3.7	N Limited	0.020
August	0.080	2.700	1.000	2.8	N Limited	0.177
September	0.160	2.500	0.860	3.1	N Limited	0.112
¹ TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
² (TP [mg/l] *0.08982555)Flow [ft3/sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-16A to represent TSS discharge into downstream waters.

The August and September samples indicate unnaturally high TSS concentrations (Table 114). This sediment is due to accelerated surface erosion and mass wasting following late summer thunderstorms on uplands burned in the 2013 McCan Fire.

Table 114. East Fork Corral Creek (US-16) total suspended solids.

17040220-16A EF Corral Creek			
Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	10.0	10.74	1.76
May	<5.0	11.73	0.96
June	7.5	9.738	1.20
July	6.5	3.028	0.32
August	220.0	1.973	7.12
September	250.0	1.453	5.95
¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]			

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-16A are displayed in Table 115. Sample results for 17040220-16A indicate one trigger for PCR during August. This value may be attributable to the significant volumes of storm-driven sediment that moved through the system

during this month. Further monitoring is necessary to determine if bacteria levels are normally high in August or if this single sample was an anomaly resulting from critical conditions experienced at that point in time.

Table 115. East Fork Corral Creek (US-16) *E. coli*.

17040220-16A EF Corral Creek			
Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/100mL	ft ³ /sec	
April	2.0	10.74	--
May	2.0	11.73	--
June	36.4	9.74	--
July	125.0	3.03	--
August	488.4	1.97	PCR
September	135.0	1.45	--
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Temperature

No historic or current temperature data exist for US-16.

2.4.16.3 TMDL Targets, Loads, and Status

No TMDLs were developed for the AUs in this water body.

2.4.17 West Fork Corral Creek – Source to Mouth (US-17)

For an overview of this WBID, see Figure 87.



Figure 87. WBID US-17, West Fork Corral Creek – source to mouth.

2.4.17.1 Assessment Units

AU ID17040220SK017_02 includes the 1st- and 2nd-order tributaries contributing to the 3rd-order of Corral Creek, totaling 10.31 miles. The main 2nd-order channel is perennial. Other channels in this AU are ephemeral but may exhibit perennial characteristics depending on depth of snowpack and spring flow duration (Table 116).

Table 116. West Fork Corral Creek (US-17) assessment unit.

Idaho's 2012 Integrated Report				AU		Stream Segment			
Category 2: Full Support				ID17040220SK017_02		West Fork Corral Creek – source to mouth 10.31 MILES			
Beneficial Use		_02	Causes			Reference			
Cold water aquatic life		FS							
Secondary contact recreation		FS							
Agricultural water supply		NA							
Industrial water supply		NA							
Wildlife habitat		NA							
Aesthetic		NA							
NA = Not Assessed, FS = Fully Supporting									
AU order	Assessment ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	1993STWFA006	WF Corral Creek	43.76	2.00	—	—	28.00	1.00	1.50

General Observations

Flow, habitat, and use observations during 2014 identified these factors that drive the water quality conditions within WBID US-17:

1. The 2013 McCan Fire occurred partially in this water body. Influences from this fire were obvious in 2014 in the form of sediment mobility and mass wasting during precipitation events.
2. Intense localized precipitation events in August and September 2014 caused significant debris flows and channel restructuring in this water body (Figure 88).



Figure 88. West Fork Corral Creek (US-17)—natural channel restructuring following debris flow, 9/03/2014.

Flow

Flows were measured on East Fork Corral Creek at sampling location 17040220-17A. This site is at the end of Corral Creek Road. Measurable flows persisted through the 2014 sampling season (Figure 89).

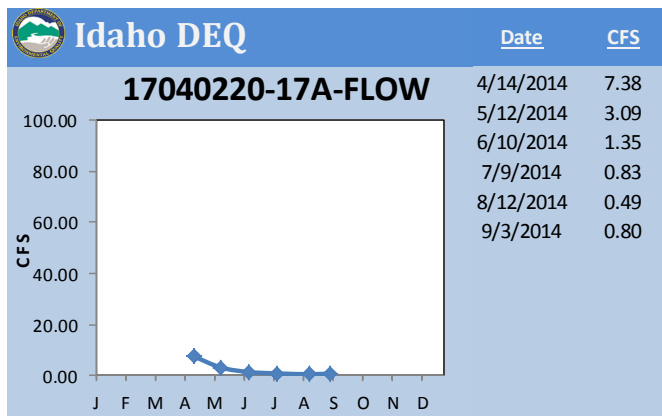


Figure 89. Flows at 17040220-17A, 2014.

Past Conditions

The 2005 Camas TMDL did not disclose any information specific to the water quality or beneficial uses for US-17.

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 90). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and E.

coli. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 117).



Figure 90. Sample site 17040220-17A, upstream and downstream, 7/09/2014.

Table 117. West Fork Corral Creek (US-17) water chemistry.

17040220-17A West Fork Corral Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TSS	<i>E. coli</i>	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100mL	ft ³ /sec
4/14/2014	<0.010	1.50	0.48	0.18	18	8.6	7.378
5/12/2014	<0.010	0.57	0.39	0.042	5.5	8.6	3.088
6/10/2014	<0.010	0.31	0.21	0.05	5.5	24.6	1.349
7/9/2014	<0.010	0.32	0.22	0.057	<5.0	248.9	0.828
8/12/2014 ¹	0.25	0.22	4.7	2.1	640	1,467.20	0.494
9/3/2014 ²	0.12	0.24	2.4	1.7	400	344.9	0.798
1. Recent debris flows have formed new channels; substrate very unstable.							
2. Turbid. Debris flows still appear active; channels are unstable and dynamic.							

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-17A to represent nutrient discharge into downstream waters. This site is at the end of Corral Creek Road.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 118). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 118. West Fork Corral Creek (US-17) nutrient summary.

17040220-17A West Fork Corral Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TN:TP Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	1.500	0.480	0.180	11.0	--	0.119
May	0.570	0.390	0.042	22.9	P Limiting	0.012
June	0.310	0.210	0.050	10.4	--	0.006
July	0.320	0.220	0.057	9.5	N Limiting	0.004
August	0.220	4.700	2.100	2.3	N Limiting	0.093
September	0.240	2.400	1.700	1.6	N Limiting	0.122
¹ TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting ² (TP [mg/L] *0.08982555)Flow [ft ³ /sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-17A to represent TSS discharge into downstream waters.

The August and September samples indicate unnaturally high TSS concentrations (Table 119). This sediment is due to accelerated surface erosion and mass wasting following late summer thunderstorms on uplands burned in the 2013 McCan Fire.

Table 119. West Fork Corral Creek (US-17) total suspended solids.

17040220-17A WF Corral Creek			
Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	18.0	7.38	2.18
May	5.5	3.09	0.28
June	5.5	1.349	0.12
July	<5.0	0.828	0.07
August	640.0	0.494	5.18
September	400.0	0.798	5.23
¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]			

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-17A are displayed in Table 120. Sample results for 17040220-17A indicate one trigger above criteria for PCR during August. This value may be attributable to the significant volumes of storm-driven sediment that moved through the system during this month. Further monitoring is necessary to determine if bacteria levels are

normally high in August or if this single sample was an anomaly resulting from critical conditions experienced at that point in time.

Table 120. West Fork Corral Creek (US-17) *E. coli*.

17040220-17A WF Corral Creek			
Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/100mL	ft ³ /sec	
April	8.6	7.38	--
May	8.6	3.09	--
June	24.6	1.35	--
July	248.9	0.83	--
August	1467.2	0.49	PCR, SCR
September	344.9	0.80	--
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Temperature

No historic or current temperature data exist for US-17.

2.4.17.2 TMDL Targets, Loads, and Status

No TMDLs were developed for the AU in this water body.

2.4.18 Camas Creek (US-18)

For an overview of this WBID, see Figure 91.

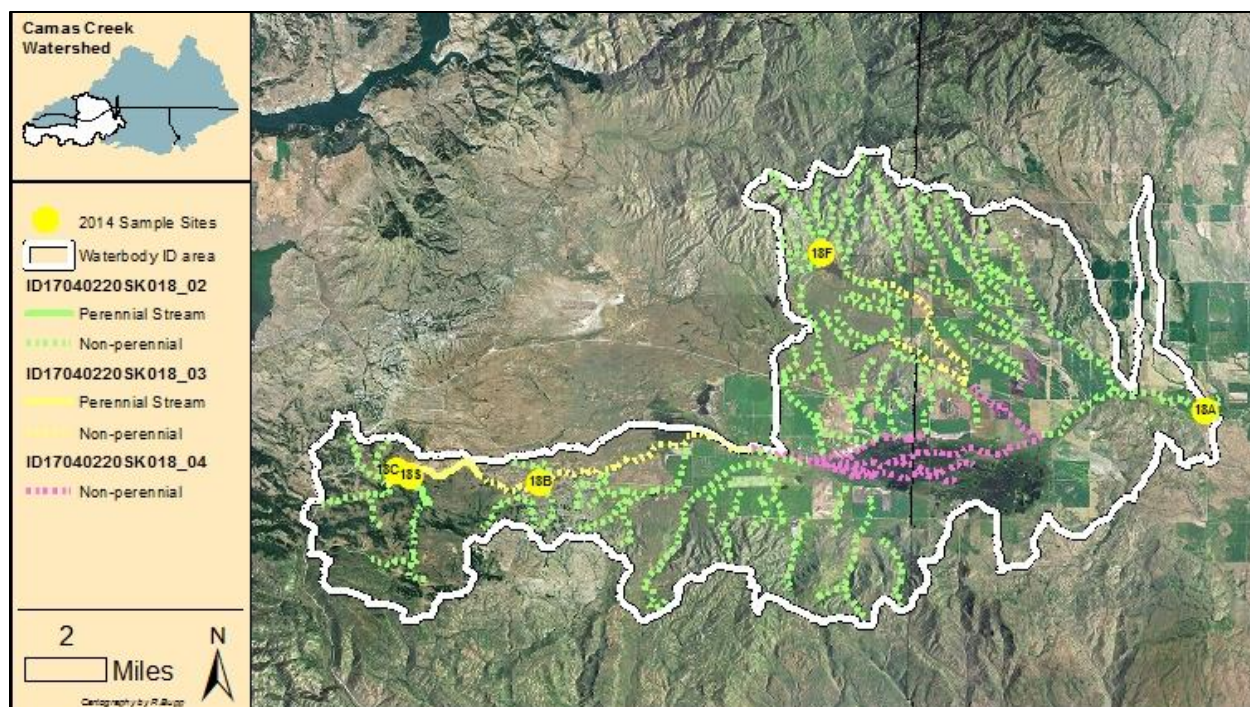


Figure 91. WBID US-18, Camas Creek.

2.4.18.1 Assessment Units

AU ID17040220SK018_02 contains the 1st- and 2nd-order tributaries contributing to the 3rd-order channels within US-18, Camas Creek. This AU includes the upper reach and tributaries of Camas Creek, Sheep Creek, and the 2nd-order channel of Cow Creek, totaling 135.60 miles. Perennial segments are dependent on intact beaver complexes. Other segments are ephemeral/episodic, exhibiting flows only in direct response to snowmelt or precipitation events.

AU ID17040220SK018_02L is Cow Creek Reservoir. At full capacity, the surface area is 7.79 acres.

AU ID17040220SK018_03 includes the 3rd-order channels of Camas Creek and Cow Creek, totaling 18.61 miles. These segments are ephemeral, exhibiting flows only in direct response to snowmelt, ground water expression, or precipitation events.

AU ID17040220SK018_04 is the 4th-order of Camas Creek beginning at the Cow Creek confluence and ending at Corral Creek for a total channel length of 20.53 miles. This segment is ephemeral, exhibiting flows only in direct response to snowmelt, ground water expression, or precipitation events. This AU includes the Centennial Marsh (Table 121).

Table 121. Camas Creek (US-18) assessment units.

Idaho's 2012 Integrated Report					AU	Stream Segment			
Category 3: Unassessed Waters					ID17040220SK018_02L	Unnamed Diversion to Camas Creek 7.79 ACRES			
					ID17040220SK018_02	Camas Creek – source to Corral Creek 135.6 MILES			
Category 4a: Impaired Waters with approved TMDLs					ID17040220SK018_03	Camas Creek – source to Corral Creek 18.61 MILES			
					ID17040220SK018_04	Camas Creek – source to Corral Creek 20.53 MILES			
Beneficial Use	_02L	_02	_03	_04	Causes		Reference		
Cold water aquatic life	NA	NS	NS	NS	Phosphorus (Total) Sedimentation/Siltation Temperature, water		TMDL: Camas – Lack of flow (pg. 201) Cow – Sediment, Nutrients (pg. 186)		
Salmonid spawning	NA	NA	NA	NA					
Primary contact recreation	NA	NA	NA	NA					
Agricultural water supply	NA	NA	NA	NA					
Industrial water supply	NA	NA	NA	NA					
Wildlife habitat	NA	NA	NA	NA					
Aesthetic	NA	NA	NA	NA					
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	1993STWFA009	Cow Creek	16.21	0.00	—	—	19.00	1.00	0.00
03	1995STWFA014	Camas Creek	20.23	0.00	—	—	37.00	1.00	0.00
03	1996STWFB069	Cow Creek	—Dry—						
03	2001STWFA047	Cow Creek	—Dry—						
03	2004SBOIA086	Camas Creek	—Marshland—						
03	2007STWFA100	Unnamed stream	—Denied Access—						
03	2014STWFA045	Cow Creek	—Dry—						
04	2010SDEQA033	Unnamed Stream	—Dry—						
04	2010SDEQA068	Cow Creek	—Dry—						
04	2010SDEQA196	Cow Creek	—Dry—						

2.4.18.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-18:

1. Camas Creek, Cow Creek, and tributaries in this WBID are predominately ephemeral. Where perennial waters do exist, they are associated with beaver complexes and wetlands. Surface flow through these braided areas is not measurable or noticeably channelized.
2. The Centennial Marsh collects all waters in US-18. This complex provides natural filtering of surface waters moving through this system. The 3,100-acre wetland complex is owned by the State of Idaho and managed by the Idaho Department of Fish and Game (Figure 92).
3. The 2nd-order of the Camas Creek channel is heavily braided by beaver complexes. Short-term diversion for irrigation of adjacent pastures occurs within this complex as water levels and beaver dam arrangements allow. This diversion does not appear to be negatively impacting beaver activity or the persistence of ponded water downstream.
4. Sheep Creek is a tributary of Camas Creek in this WBID. Flow in Sheep Creek is perennial as sampled in 2014 in a short (50 meter) segment near the Camas Creek confluence. The remainder of Sheep Creek is inundated by beaver complexes.
5. Cow Creek above the reservoir is significantly incised to depths up to 12 feet. Large woody vegetation now inhabits this channel. The current willow and aspen community appears to be at least 25 years old, is well rooted, and is exhibiting new-growth recruitment. The historical conditions or land-uses that contributed to the channel incision appear to have ceased.
6. Cow Creek is 100% stored for irrigation at the reservoir. The channel below the reservoir is not flow-connected to the channel above the reservoir. Wetland conditions may occur in the 3rd-order channel of Cow Creek where irrigation water is returned, or as a result of ground water expression.



Figure 92. Centennial Marsh, 4/29/2014.

Flow

Flows were measured for Camas Creek at sampling location 17040220-18A at the Barron Road crossing. Flow at this location is dependent on discharge from the Centennial Marsh and any additional gains from Chimney Creek (US-19). April provided the only measurements at 6.80 cfs and 1.70 cfs (Figure 93). All other visits yielded ponded, no-flow conditions or a dry channel.

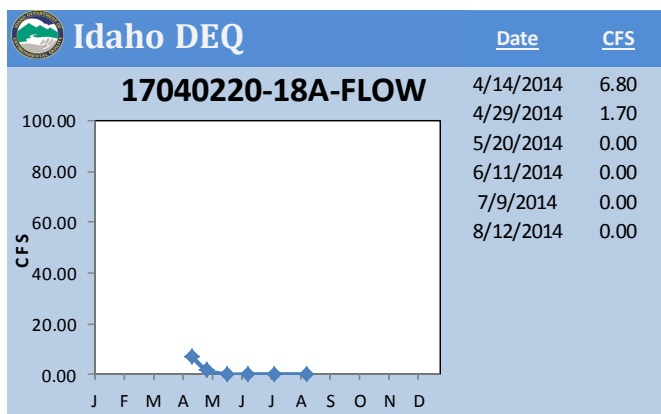


Figure 93. Flows at 17040220-18A, 2014.

Flows were collected for Cow Creek at sampling location 17040220-18F at the Cow Creek Road crossing. April and May provided the only measurements of significance at 0.57 cfs and 0.31 cfs, respectively. A trace flow of 0.01 cfs was recorded for June. Subsequent visits yielded a dry channel (Figure 94).

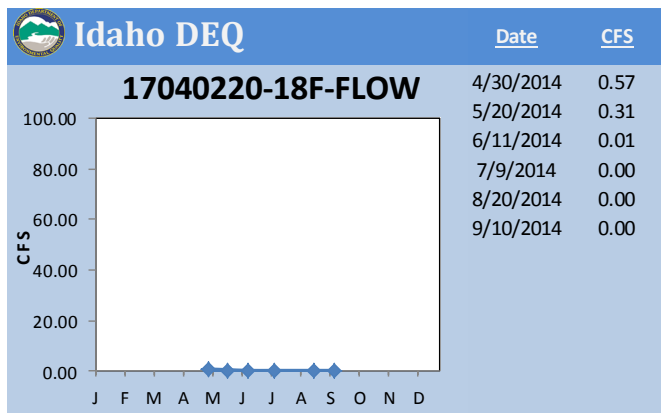


Figure 94. Flows at 17040220-18F, 2014.

A few additional locations in WBID US-18 were measured for streamflow in 2014. Results from these random sampling events are displayed below under Current Conditions.

Past Conditions

The 2005 Camas TMDL states the following regarding the whole of Camas Creek:

Through the subbasin assessment process, it has been identified that the water quality and beneficial uses of Camas Creek are being impacted by pollutants. The pollutants of concern in the water body have been

found to be sediment, nutrients, and temperature. Nutrients are a pollutant to Camas Creek as well as to Magic Reservoir the receiving water of Camas Creek...

...Lack of flow is the largest impact to beneficial uses of Camas Creek. (DEQ 2005, pg. 201)

The TMDL also states the following in regard to Cow Creek above the reservoir:

Through the subbasin assessment process, it has been identified that the water quality and beneficial uses of Cow Creek are being impacted by pollutants. The pollutants of concern in the water body have been found to be sediment and nutrients. Nutrients are not impacting this segment of Cow Creek; however, as the creek discharges into a reservoir a TMDL will be completed to limit nutrient delivery to the reservoir. (DEQ 2005, pg. 186)

Current Conditions

DEQ sampled this water body from April 2014 through September 2014. These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 122).

Sample site 17040220-18A was located at the WBID US-18 pour point to describe surface water quality being discharge downstream (Figure 95).

Additional locations were sampled in an effort to determine where surface water persisted throughout the summer and to further describe conditions across the water body. The location descriptions are as follows:

- 17040220-18A: 4th-order Camas Creek at Barron Road
- 17040220-18B: 3rd-order Camas Creek mid-channel
- 17040220-18C: 2nd-order Camas Creek above Sheep Creek
- 17040220-18F: 2nd-order Cow Creek above reservoir (Figure 96)
- 17040220-18S: 2nd-order Sheep Creek above Camas Creek



Figure 95. Sample site 17040220-18A, 5/20/2014 and 7/09/2014.



Figure 96. Sample site 17040220-18F, 5/20/2014 and 7/09/2014.

Table 122. Camas Creek (US-18) water chemistry.

17040220-18A Camas Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	Total Suspended Solids	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100mL	ft ³ /sec
4/14/2014	<0.010	<0.010	1.1	0.092	<5.0	3.1	6.795
4/29/2014	--	--	--	--	--	--	1.700
5/20/2014	--	--	--	--	--	--	no flow
6/11/2014	--	--	--	--	--	--	no flow
7/9/2014	--	--	--	--	--	--	no flow
8/12/2014	--	--	--	--	--	--	dry
9/3/2014	--	--	--	--	--	--	dry
17040220-18B Camas Creek							
5/20/2014	<0.010	<0.010	0.64	0.073	7.5	18.7	1.246
6/17/2014 ¹	0.011	<0.010	0.76	0.11	5.5	58.3	0.260
7/15/2014 ²	--	--	--	--	--	--	no flow
8/19/2014	--	--	--	--	--	--	dry
17040220-18C Camas Creek							
6/24/2014	<0.010	<0.010	0.46	0.096	12	40.8	0.245
8/19/2014	0.013	<0.010	0.51	0.096	12	80.9	0.537
1. Active beaver damming upstream and downstream resulting in ponding. Flow apparent in a small location between ponds; flow and samples taken here.							
2. Beaver ponds retaining water. No flow between ponds.							
17040220-18F Cow Creek							
4/30/2014	--	--	--	--	--	--	0.567
5/20/2014	<0.010	<0.010	0.48	0.18	<5.0	8.6	0.311
6/11/2014	0.022	<0.010	0.75	0.4	<5.0	8.5	0.012
7/9/2014	--	--	--	--	--	--	dry
8/20/2014	--	--	--	--	--	--	dry
9/10/2014	--	--	--	--	--	--	dry
10/27/2014	--	--	--	--	--	--	dry
17040220-18S Sheep Creek							
6/24/2014	<0.010	<0.010	0.38	0.064	<5.0	121.1	0.238
8/19/2014	<0.010	<0.010	0.75	0.073	<5.0	689.6	0.004

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-18A to represent nutrient discharge into downstream waters. Additional locations on Camas Creek and Cow Creek were sampled during 2014 to determine where surface water persisted and describe the water quality at these sites.

To explain nutrient conditions in these waters, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 123 and Table 124). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 123. Camas Creek (US-18) nutrient summary.

17040220-18() Camas Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	TSS	TN:TP Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
Apr (18A)	<0.010	1.100	0.092	12.1	--	0.056
May (18B)	<0.010	0.640	0.073	8.9	N Limiting	0.008
Jun (18B)	<0.010	0.760	0.110	7.0	N Limiting	0.003
Jun (18C)	<0.010	0.460	0.096	4.9	N Limiting	0.002
Jun (18S)	<0.010	0.480	0.180	2.7	N Limiting	0.009
July	--	--	--	--	--	--
Aug (18C)	<0.010	0.510	0.096	5.4	N Limiting	0.005
Aug (18S)	<0.010	0.750	0.400	1.9	N Limiting	0.000
September	--	--	--	--	--	--
1 TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
2 (TP [mg/l] *0.08982555)Flow [ft3/sec] = TP load [lbs/day]						

Table 124. Cow Creek (US-18) nutrient summary.

17040220-18F Cow Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	TSS	TN:TP Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	--	--	--	--	--	--
May	<0.010	0.480	0.180	2.7	N Limiting	0.005
June	<0.010	0.750	0.400	1.9	N Limiting	0.000
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--
October	--	--	--	--	--	--
1 TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
2 (TP [mg/l] *0.08982555)Flow [ft3/sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-18A to represent TSS discharge into downstream waters. Additional locations on Camas and Cow Creeks were sampled during 2014 to help describe the water quality at these sites. The results of the TSS analysis for Camas Creek sites are in Table 125 and Cow Creek in Table 126.

Table 125. Camas Creek (US-18) total suspended solids.

17040220-18() Camas Creek			
Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
Apr (18A)	<5.0	6.80	0.56
May (18B)	7.5	1.25	0.15
Jun (18B)	5.5	0.26	0.02
Jun (18C)	12.0	0.245	0.05
Jun (18S)	<5.0	0.311	0.03
July	--	--	--
Aug (18C)	12.0	0.537	0.11
Aug (18S)	<5.0	0.012	0.00
September	--	--	--

¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]

Table 126. Cow Creek (US-18) total suspended solids.

17040220-18F Cow Creek			
Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April	--	0.57	--
May	<5.0	0.31	0.03
June	<5.0	0.01	0.00
July	--	dry	--
August	--	dry	--
September	--	dry	--
October	--	dry	--

¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]

E. coli

Sample analysis results for *E. coli* in Camas and Cow Creeks in 2014 are displayed in Table 127 and Table 128. Samples in this WBID produced zero trigger values.

Table 127. Camas Creek (US-18) *E. coli*.

17040220-18() Camas Creek			
Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/100mL	ft ³ /sec	
Apr (18A)	3.1	6.80	--
May (18B)	18.7	1.25	--
Jun (18B)	58.3	0.26	--
Jun (18C)	40.8	0.25	--
Jun (18S)	8.6	0.31	--
July	--	--	--
Aug (18C)	80.9	0.54	--
Aug (18S)	8.5	0.01	--
September	--	--	--
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Table 128. Cow Creek (US-18) *E. coli*.

17040220-18F Cow Creek			
Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/100mL	ft ³ /sec	
April	--	0.57	--
May	8.6	0.31	--
June	8.5	0.01	--
July	--	dry	--
August	--	dry	--
September	--	dry	--
October	--	dry	--
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Temperature

Thermographs were deployed at 17040220-18A and 17040220-18F in 2014. The limited wetted period at both these locations limits the usefulness of these temperature data sets. Where water does persist perennially in the Camas Creek channel, it is ponded by beaver complexes and would not likely exhibit thermal characteristics representative of a free-flowing water body.

2.4.18.3 TMDL Targets, Loads, and Status

The 2005 Camas TMDL set sediment and heat load targets for US-18, Camas Creek. Additionally, sediment and nutrient targets specific to Cow Creek were also prescribed. Past loads, current loads, and current status are displayed in Table 129.

Table 129. Camas Creek and Cow Creek (US-18) TMDL load summary and status.

AU	TMDL Pollutant	2005 Load ^a	2014 Loads ^b	TMDL Target ^c	Target Status ^{d,e}
ID17040220SK018_02 ID17040220SK018_03 ID17040220SK018_04	Nutrients (lb/day TP)	130.49	0.056(18A)	Load capacity	Target achieved
			0.008(18B)	61.55 lb/day	
	Sediment (t/yr)	8018.8 ^f	0.003(18B)	Max. conc.	Target exceeded
			0.002(18C)	0.050 mg/L	
			0.005(18C)		
			0.56(18A)	Load capacity	Target achieved.
Temperature Solar Load ^g (kWh/day)		0.15(18B)	512.6 t/yr		
		0.02(18B)	80% bank stability	Target achieved	
		0.05(18C)			
		0.11(18C)			
Cow Creek in AU ID17040220SK018_02	Nutrients (lb/day TP)	1.72	2,063,000	1,655,000 kWh/day	Target exceeded
			Varied segment % deficiencies	Shade % per segment	Target exceeded
	Sediment (t/yr)	15.5	0.005(18F)	Load capacity	Target achieved
			0.000(18F)	61.55 lb/day	
				Max. conc.	Target exceeded
				0.050 mg/L	
			Load capacity	Target achieved.	
			512.6 t/yr		
				80% bank stability	Target achieved
<p>a. Loads identified in the 2005 Camas TMDL pgs. 201–205.</p> <p>b. Calculated from 2014 sampling results.</p> <p>c. TMDL targets prescribed in the 2005 Camas TMDL pgs. 201–205.</p> <p>d. Target status determined as described in this section’s narrative.</p> <p>e. 2005 TMDL combined all Camas Creek AUs in load analysis and target prescription.</p> <p>f. The 2005 sediment load was calculated with erosion rate, bank height, and quantity of streambank stability.</p> <p>g. Target status determined as described in the draft 2016 Camas Creek temperature PNV analysis.</p>					

Sediment TMDL

The 2005 Camas TMDL states the following:

Sediment is impacting beneficial uses of Camas Creek in the form of bed load sediment. Suspended sediment measured during drought years is not impacting water quality of the stream, however bed load sediment measured in the form of percent fines indicates that sediment is impacting water quality. A value greater than 35% for percent fines was used to indicate that sediment was impacting the water body. If this was the case then stream bank erosion inventories were completed to determine if stream bank erosion was the contributor of sediment impact. The target for stream bank erosion TMDLs is 80% bank stability. (DEQ 2005)

Sampling of US-18 in 2014 included analysis for TSS for Camas Creek and yielded instantaneous loads as displayed in Table 125. Existing TSS loads are significantly lower than the sediment load identified in the 2005 Camas TMDL (8,018.8 tons/year). Although these numbers cannot be compared directly, the TSS numbers do show that the water column loads in this AU are relatively low.

A walking bank stability inspection was completed on 2nd- and 3rd-order channels of Camas Creek near Sheep Creek. The streambank condition in this reach is 100% covered and stable and is dominated by beaver dam complexes. The riparian area appears to be aggrading and widening due to this beaver activity.

Sampling of US-18 in 2014 also included analysis for TSS for Cow Creek. This effort yielded instantaneous loads as displayed in Table 126. Existing TSS loads are significantly lower than the sediment load target identified in the 2005 Camas TMDL (512.6 tons/year). Although these numbers cannot be compared directly, the TSS numbers do show that the water column loads in this AU are relatively low.

Cow Creek above the reservoir is significantly incised to depths up to 12 feet. Large woody vegetation now inhabits this channel. The current willow and aspen community appears to be at least 25 years old, is well rooted, and is exhibiting new-growth recruitment. The historical conditions or land-uses that contributed to the channel incision appear to have ceased.

Nutrient TMDL

The 2005 Camas TMDL states the following:

Nutrients are impacting the CWAL beneficial uses of Camas Creek, but as the creek discharges into a reservoir the TMDL is completed to limit nutrient delivery to the reservoir. The target for water bodies discharging into a storage system is 0.050 mg/L. This goal should aid limiting excessive delivery of nutrients to the reservoir. As a result 0.050 mg/L is the target to be used in the development of a nutrient TMDL for Camas Creek. (DEQ 2005)

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. To review the performance of the TMDL, instantaneous daily loads for TP have been calculated for each sample event (Table 130). These daily loads are significantly lower than the load capacity recorded in the TMDL (61.55 lb/day), and the concentrations were higher than the TMDL maximum of 0.050 mg/L. For these reasons, the TP loads are far below the daily load capacity in Camas Creek but consistently exceed the target TMDL concentration.

Table 130. Camas Creek (US-18) total phosphorus loads.

17040220-18() Camas Creek			
Total Phosphorus			
Sample Month	TP	Flow	TSS Load¹
	mg/L	ft ³ /sec	tons/year
Apr (18A)	0.092	6.80	0.056
May (18B)	0.073	1.25	0.008
Jun (18B)	0.110	0.26	0.003
Jun (18C)	0.096	0.245	0.002
Jun (18S)	0.180	0.311	0.009
July	--	--	--
Aug (18C)	0.096	0.537	0.005
Aug (18S)	0.400	0.012	0.000
September	--	--	--

¹ (TP [mg/l] *0.08982555)Flow [ft³/sec] = TP load

Cow Creek was also sampled for nutrients in 2014. To review the performance of the TMDL, instantaneous daily loads for TP have been calculated for each sample event (Table 131). These daily loads are significantly lower than the load capacity recorded in the TMDL (61.55 lb/day), and the concentrations were higher than the TMDL maximum of 0.050 mg/L. For these reasons, the TP loads are far below the daily load capacity in Cow Creek but consistently exceed the target TMDL concentration.

Table 131. Cow Creek (US-18,) total phosphorus loads.

17040220-18F Cow Creek			
Total Phosphorus			
Sample Month	TP	Flow	TSS Load¹
	mg/L	ft ³ /sec	tons/year
April	--	0.57	--
May	0.180	0.31	0.01
June	0.400	0.01	0.00
July	--	dry	--
August	--	dry	--
September	--	dry	--
October	--	dry	--

¹ (TP [mg/l] *0.08982555)Flow [ft³/sec] = TP load

Temperature TMDL

A PNV analysis was completed for this water body in 2016 to re-evaluate segment shade targets and heat loading. As a result, updated existing loads and new total solar load targets are suggested as displayed in Table 132.

Table 132. Camas Creek (US-18) heat load summary.

US-18; Camas Creek			
PNV Temperature Loads¹			
AU	Target	Existing	Excess
	kWh/day	kWh/day	kWh/day
018_02	11,000	12,000	1,000
018_03	300,000	480,000	180,000
018_04	670,000	800,000	130,000
018_05	674,000	771,000	97,000

¹ Solar loading from 2016 PNV Temperature TMDL.

The existing shade for each segment was found to vary. Some segments meet or exceed the shade potential, and some segments are shade deficient. Based on the 2016 PNV shade analysis, thermograph data set, and discharge measurements across WBID US-18, the following conclusions are drawn for water temperature:

- Camas Creek stream temperatures appear to be heavily influenced by flow regime, interaction with ground water, and extent of beaver ponding activity.

- All AUs in WBID US-18 are exceeding the heat loading targets prescribed in the 2016 Camas PNV analysis. However, the condition of greatest impairment to the beneficial uses in this AU appears to be the ephemeral (dry) regime, rather than solar loading.
- The ephemeral flows, low-gradient topography, and shallow water tables in this WBID promote wetland conditions. Salmonid spawning has not been assessed for these AUs. If spawning is occurring, it is likely limited to favorable beaver complex areas in the upper extent of Camas Creek and associated tributaries.

2.4.19 Chimney Creek (US-19)

For an overview of this WBID, see Figure 97.

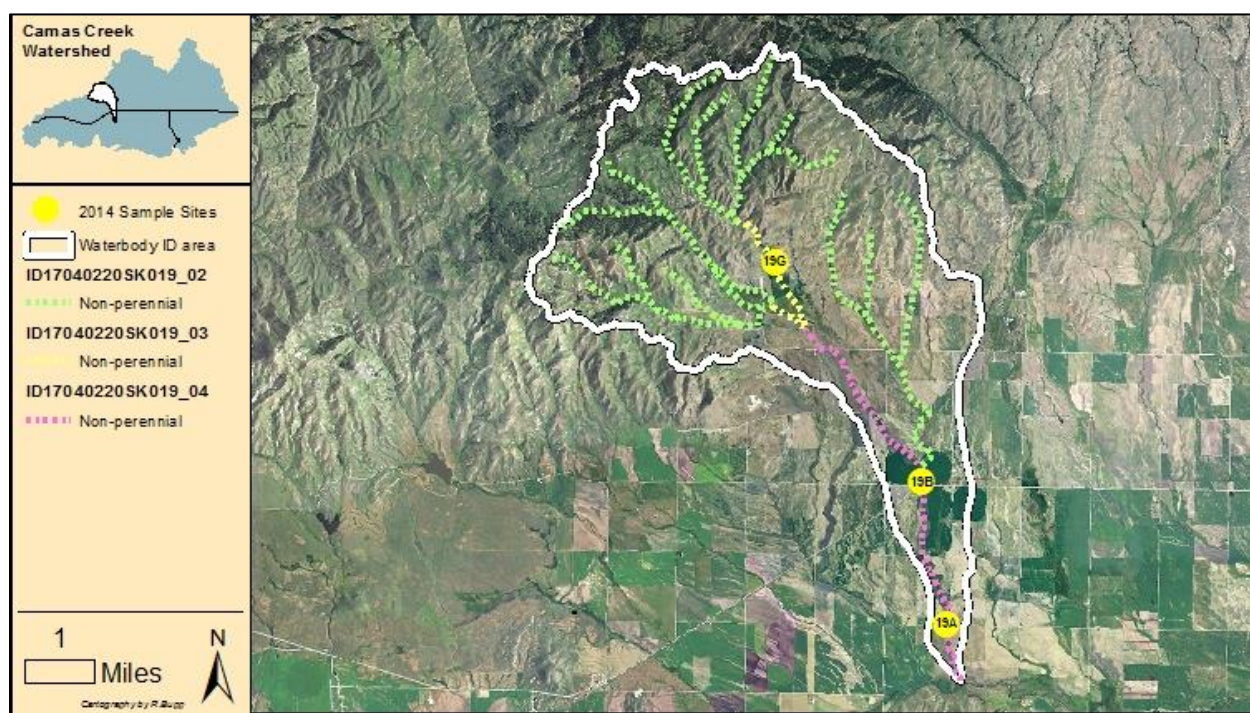


Figure 97. WBID US-19, Chimney Creek – source to mouth.

2.4.19.1 Assessment Units

All AUs are ephemeral, mostly exhibiting flows in direct response to snowmelt and precipitation events.

AU ID17040220SK019_02 includes the 1st- and 2nd-order tributaries contributing to the 3rd-order branches of Chimney Creek, totaling 31.98 miles.

AU ID17040220SK019_03 includes two 3rd-order branches of Chimney Creek, totaling 2.54 miles.

AU ID17040220SK019_04 is the 4th-order of Chimney Creek, totaling 7.6 miles. The lower reach of this AU interfaces with a shallow water table, providing surface expression of the ground water throughout the year (Table 133).

Table 133. Chimney Creek (US-19) assessment units.

Idaho’s 2012 Integrated Report					AU		Stream Segment		
Identified to have zero flow					ID17040220SK019_04		Chimney Creek		
Category 2: Full Support					ID17040220SK019_02		Chimney Creek – source to mouth 31.98 MILES		
Category 3: Unassessed Waters					ID17040220SK019_03		Chimney Creek – source to mouth 2.54 MILES		
					ID17040220SK019_04		Chimney Creek – source to mouth 7.6 MILES		
Beneficial Use		_02	_03	_04	Causes		Reference		
Cold water aquatic life		FS	—	—					
Secondary contact recreation		FS	—	—					
Agricultural water supply		NA	NA	NA					
Industrial water supply		NA	NA	NA					
Wildlife habitat		NA	NA	NA					
Aesthetic		NA	NA	NA					
NA = Not Assessed, FS = Fully Supporting, NS = Not Supporting									
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	1996STWFB068	Chimney Creek	74.22	3.00	—	—	44.00	1.00	2.00
02	2001STWFA044	Sheep Creek	—Dry—						
02	2007STWFA101	Chimney Creek	—No data collected—						
02	2010SDEQA104	Unnamed stream	—Dry—						
02	2011STWFA048	Sheep Creek	—Dry—						
02	2014STWFA074	Mays Creek	—Dry—						

2.4.19.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-19:

1. All stream segments comprising AU ID17040220SK019_02 are ephemeral.
2. The two channels comprising AU ID17040220SK019_03 are ephemeral. These exhibited response to precipitation in September 2014.
3. ID17040220SK019_04 is ephemeral.

4. The mid-channel areas of ID17040220SK019_04 appear to be used for irrigation conveyance and withdrawal as indicated by the presence of pumps and ponds.
5. The lower extent of ID17040220SK019_04 interfaces with a shallow water table, providing surface expression of the ground water throughout the year. Although the main channel is dry, pool areas remain full at water-table level (Figure 98).



Figure 98. Chimney Creek perennial pool in dry channel.

Flow

Flow was measured for Chimney Creek at sampling location 17040220-19A at the West 200 South road crossing. April provided the only measurable flow for this location (Figure 99).

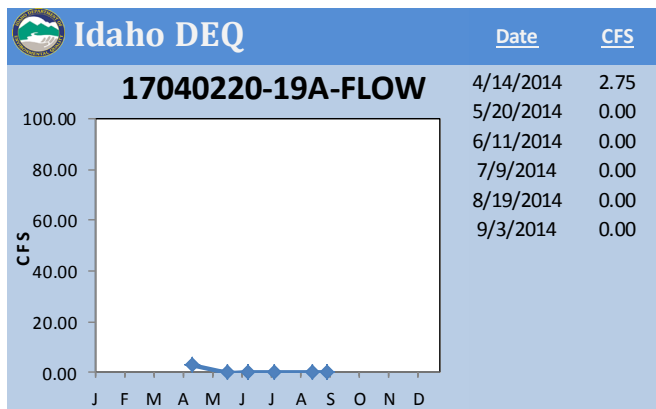


Figure 99. Flows at 17040220-19A, 2014.

Past Conditions

The 2005 Camas TMDL did not disclose any information specific to the water quality or beneficial uses for US-19, Chimney Creek.

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 100). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 134). As sampling locations presented no-flow or dry conditions, new locations were established upstream.



Figure 100. Sample site 17040220-19A, 4/14/2014 and 9/03/2014.

Table 134. Chimney Creek (US-19) water chemistry.

17040220-19A Chimney Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	Total Suspended Solids	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100mL	ft ³ /sec
4/14/2014	<0.010	<0.010	0.43	0.092	<5.0	4.1	2.747
5/20/2014 ¹	--	--	--	--	--	--	no flow
6/11/2014	--	--	--	--	--	--	no flow
7/9/2014	--	--	--	--	--	--	no flow
8/19/2014	--	--	--	--	--	--	dry
9/3/2014	--	--	--	--	--	--	dry
1. Stream is ponded, but not flowing; will attempt sampling upstream.							
17040220-19B Chimney Creek							
5/20/2014	<0.010	<0.010	0.91	0.18	<5.0	79.8	4.462
6/11/2014	--	--	--	--	--	--	no flow
7/9/2014	--	--	--	--	--	--	dry
8/19/2014	--	--	--	--	--	--	dry
9/3/2014	--	--	--	--	--	--	dry
17040220-19G Chimney Creek							
6/11/2014	<0.010	<0.010	0.55	0.22	5.5	191.8	0.485
7/9/2014	--	--	--	--	--	--	no flow
8/19/2014	--	--	--	--	--	--	no flow
9/3/2014	0.014	0.010	0.59	0.19	5.5	96.2	0.376

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-19A to represent nutrient discharge into downstream waters. This sample site is located on AU ID17040220SK019_04 upstream from the confluence with Camas Creek. As flow diminished, new sampling locations were established upstream. Nutrient conditions specific to the upstream locations are included in Table 135.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 135). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 135. Chimney Creek (US-19) nutrient summary.

17040220-19() Chimney Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	TP	TN:TP Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
Apr (19A)	<0.010	0.430	0.092	4.8	N Limiting	0.023
May (19B)	<0.010	0.910	0.180	5.1	N Limiting	0.072
Jun (19G)	<0.010	0.550	0.220	2.5	N Limiting	0.010
July	--	--	--	--	--	--
August	--	--	--	--	--	--
Sep (19G)	0.010	0.590	0.190	3.2	N Limiting	0.006
¹ TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
² (TP [mg/l] *0.08982555)Flow [ft3/sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-19A to represent TSS discharge into downstream waters. This sample site is located on AU ID17040220SK019_04 upstream from the confluence with Camas Creek. As flow diminished, new sampling locations were established upstream. TSS conditions specific to the upstream locations are included in Table 136.

Table 136. Chimney Creek (US-19) total suspended solids.

17040220-19() Chimney Creek			
Total Suspended Solids			
Sample Month	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
Apr (19A)	<5.0	2.75	0.23
May (19B)	<5.0	4.46	0.37
Jun (19G)	5.5	0.49	0.04
July	--	--	--
August	--	--	--
Sep (19G)	5.5	0.376	0.03
¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]			

E. coli

Sample analysis results for *E. coli* for sites sampled in US-19 in 2014 are displayed in Table 137 and do not indicate any *E. coli* concentrations above trigger values.

Table 137. Chimney Creek (US-19) *E. coli*.

17040220-19() Chimney Creek			
Bacteria			
Sample Month	<i>E.coli</i>	Flow	Trigger¹
	MPN/100mL	ft ³ /sec	
Apr (19A)	4.1	2.75	--
May (19B)	79.8	4.46	--
Jun (19G)	191.8	0.49	--
July	--	--	--
August	--	--	--
Sep (19G)	96.2	0.38	--

¹ > 406cfu/100ml for Primary Contact Recreation
> 576 cfu/100ml for Secondary Contact Recreation

Temperature

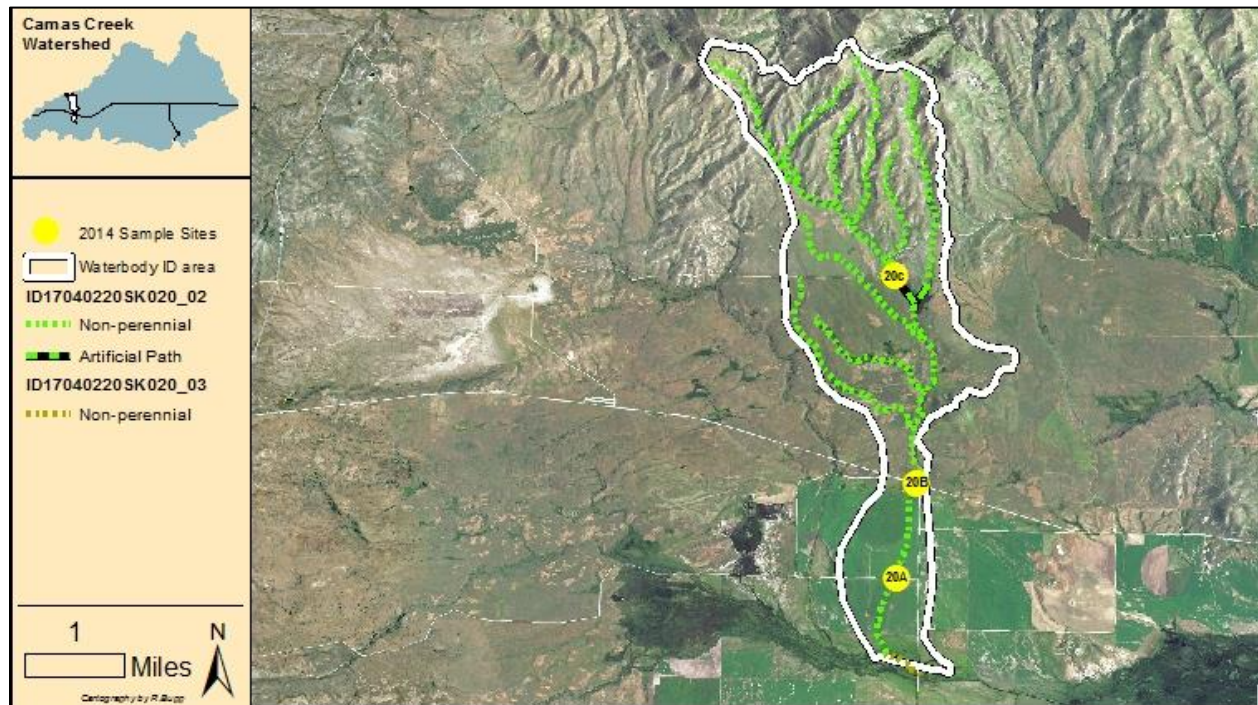
No historic or current temperature data exist for US-19.

2.4.19.3 TMDL Targets, Loads, and Status

No TMDLs were developed for the AUs in this water body.

2.4.20 Negro Creek (US-20)

For an overview of this WBID, see Figure 101.

**Figure 101. WBID US-20, Negro Creek – source to mouth.**

2.4.20.1 Assessment Units

AU ID17040220SK020_02 includes the 1st- and 2nd-order tributaries contributing to the 3rd-order of Camas Creek, totaling 21.23 miles. Segments are ephemeral, mostly exhibiting flows in direct response to snowmelt and precipitation events. Augmented main channel flows are due to irrigation conveyance releases from a reservoir.

AU ID17040220SK020_03 is a connected historic channel of the 3rd-order of Camas Creek and is identified to be 0.43 miles. The spatial extent of this AU is related to Camas Creek, rather than the 3rd-order channel segment of Negro Creek (Table 138).

Table 138. Negro Creek (US-20) assessment units.

Idaho's 2012 Integrated Report			AU	Stream Segment
Category 2: Full Support			ID17040220SK020_02	Negro Creek – 1st and 2nd order 21.23 MILES
Category 3: Unassessed Waters			ID17040220SK020_03	Negro Creek – 3rd order 0.43 MILES
Beneficial Use	_02	_03	Causes	Reference
Primary contact recreation	NA	—		
Secondary contact recreation	FS	—		
Agricultural water supply	NA	NA		
Industrial water supply	NA	NA		
Wildlife habitat	NA	NA		
Aesthetic	NA	NA		

Beneficial Use Comments

Secondary Contact Recreation:

5/6/2012 (HS) - DEQ's Boise Region collected an E. coli sample from Negro Creek on 5/12/2011. The result was 13.4 CFU/100ml, which is below the threshold for repeat sampling. This creek therefore fully supports secondary contact recreation.

AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	2001STWFA049	Negro Creek							—Dry—
02	2014STWFA046	Negro Creek							—Dry—

2.4.20.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified these factors that drive the water quality conditions within WBID US-20.

1. ID17040220SK020_03 is spatially represented to be associated with Camas Creek (US-18) rather than Negro Creek. The actual spatial extent of this AU needs ground-truthing to support the appropriate change in ADB.
2. ID17040220SK020_02 is ephemeral, flowing in direct response to snowmelt and precipitation.
3. An irrigation storage reservoir near Wildhorse Road entrains surface flows on the upper reaches of this AU. These waters are conveyed in the Negro Creek channel during the irrigation season until the storage is depleted. Downstream irrigation flow is captured then pumped from an in-channel pond below sample site 17040220-20A (Old Highway 68) (Figure 102). All irrigation flow is used at this pump; zero surface flow reaches the Camas Creek channel except during periods of seasonal runoff.



Figure 102. Irrigation pond at 17040220-20A.

Flow

Flows were measured for Negro Creek at sampling location 17040220-20B, downstream of Highway 20. Ponded conditions at 17040220-20A limit accurate flow measurement.

Trace surface flows were present in Negro Creek in May. The measured May flow was 0.06 cfs. During the June 2014 visit, augmented flow conditions were present and measured at 4.21 cfs, indicating irrigation release from the upstream reservoir. Subsequent visits yielded a dry channel (Figure 103).

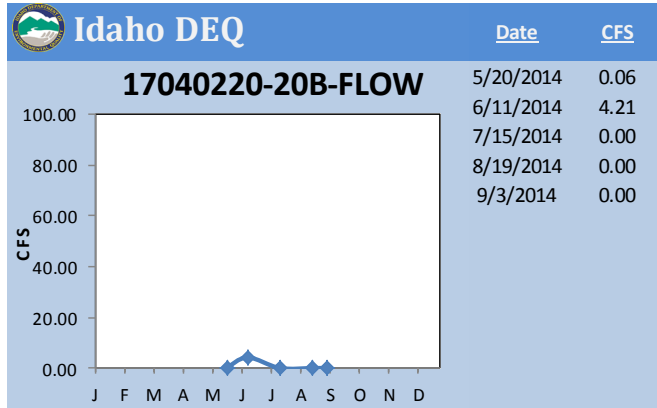


Figure 103. Flows at 17040220-20B, 2014.

Past Conditions

The 2005 Camas TMDL did not disclose any information specific to the water quality or beneficial uses for US-20.

Current Conditions

DEQ visited this water body from April 2014 through September 2014 (Figure 104). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 139).



Figure 104. Sample site 17040220-20B, 6/11/2014 and 7/09/2014.

Table 139. Negro Creek (US-20) water chemistry.

17040220-20A Negro Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	Total Suspended Solids	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100mL	ft ³ /sec
4/22/2014 ¹	<0.010	<0.010	0.43	0.066	<5.0	< 1	0.088
¹ Flow measured upstream of culvert. Flow indiscernable downstream of culvert and pond area. Irrigation pump is off.							
17040220-20B Negro Creek							
5/20/2014	<0.010	<0.010	0.32	0.094	<5.0	78.9	0.064
6/11/2014 ²	<0.010	<0.010	0.7	0.15	<5.0	123.6	4.209
7/15/2014	--	--	--	--	--	--	dry
8/19/2014	--	--	--	--	--	--	dry
9/3/2014	--	--	--	--	--	--	dry
² Increased flow resulting from irrigation flows being discharged from upstream reservoir.							

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-20B (20A in April) to represent nutrient discharge into downstream waters. Sample site 20B is located downstream of Highway 20.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 140). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 140. Negro Creek (US-20) nutrient summary.

17040220-20B Negro Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TN:TP Ratio	Limits ¹	TP Load ²
	mg/L	mg/L	mg/L			lbs/day
April (20A)	<0.010	0.430	0.066	6.7	N Limiting	0.001
May	<0.010	0.320	0.094	3.5	N Limiting	0.001
June	<0.010	0.700	0.150	4.7	N Limiting	0.057
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--
¹ TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
² (TP [mg/l] * 0.08982555) Flow [ft ³ /sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS (Table 141). Samples were collected at location 17040220-20A and 20B to represent TSS discharge into downstream waters. Sample site 20A is upstream of the Old Highway 68 crossing, and 20B is downstream of Highway 20.

Table 141. Negro Creek (US-20) total suspended solids.

17040220-20B Negro Creek Total Suspended Solids			
Sample Date	TSS	Flow	TSS Load¹
	mg/L	cfs	tons/year
April (20A)	<5.0	0.088	0.01
May	<5.0	0.064	0.01
June	<5.0	4.209	0.34
July	0	0	--
August	0	0	--
September	0	0	--

¹ (TSS [mg/L] *0.016393163)Flow [cfs] = TSS load [tons/year]

E. coli

Sample analysis results for *E. coli* in 2014 in Negro Creek are displayed in Table 142 and do not indicate any *E. coli* concentrations above trigger values.

Table 142. Negro Creek (US-20) *E. coli*.

17040220-20B Negro Creek Bacteria			
Sample Date	<i>E. coli</i>	Flow	Trigger¹
	MPN/ 100mL	ft ³ /sec	
April (20A)	< 1	0.09	--
May	78.9	0.064	--
June	123.6	4.209	--
July	0.0	0	--
August	0.0	0	--
September	0.0	0	--

¹ > 406cfu/100ml for Primary Contact Recreation
> 576 cfu/100ml for Secondary Contact Recreation

Temperature

No historic or current temperature data exist for US-20.

2.4.20.3 TMDL Targets, Loads, and Status

No TMDLs were developed for the AUs in this water body.

2.4.21 Wildhorse Creek (US-21)

For an overview of this WBID, see Figure 105.

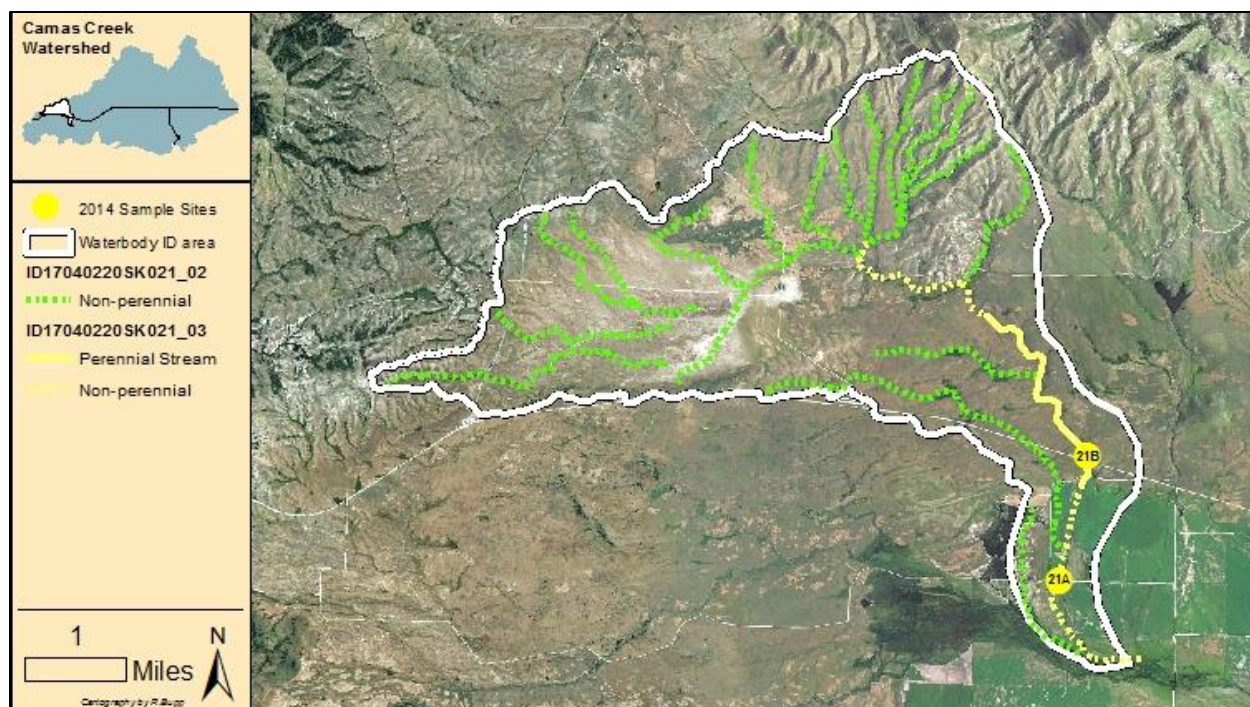


Figure 105. WBID US-21, Wildhorse Creek – source to mouth.

2.4.21.1 Assessment Units

AU ID17040220SK021_02 includes the 1st- and 2nd-order tributaries contributing to the 3rd-order of Wildhorse Creek, totaling 35.57 miles. Segments are ephemeral, mostly exhibiting flows in direct response to snowmelt and precipitation events.

AU ID17040220SK021_03 is the 3rd-order of Wildhorse Creek contributing to the 3rd-order of Camas Creek, totaling 6.96 miles. This segment has distinct perennial and ephemeral segments (Table 143).

Table 143. Wildhorse Creek (US-21) assessment units.

Idaho's 2012 Integrated Report			AU	Stream Segment
Category 2: Full Support			ID17040220SK021_02	Wildhorse Creek – 1st and 2nd order 35.57 MILES
Category 4a: Impaired Waters with approved TMDLs			ID17040220SK021_03	Wildhorse Creek – 3rd order 6.96 MILES
Beneficial Use	_02	_03	Causes	Reference
Cold water aquatic life	—	NS	Sedimentation/Siltation Temperature, water	ADB: Not identified TMDL (pg. 190): Channelization, lack of flow
Primary contact recreation	NA	—		
Secondary contact recreation	FS	NS	Escherichia coli	ADB: Not identified TMDL (pg. 190): Channelization, lack of flow
Agricultural water supply	NA	NA		
Industrial water supply	NA	NA		
Wildlife habitat	NA	NA		
Aesthetic	NA	NA		

Beneficial Use Comments**Secondary Contact Recreation**

DEQ's Boise Region collected an E. Coli sample from Wildhorse Creek on 5/13/2011. The result was 344.8 CFU/100ml, which is below the threshold for repeat sampling. This creek therefore fully supports secondary contact recreation. HS 5/6/12

AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
03	1993STWFA025	Wildhorse Creek	16.37	0.00	—	—	14.00	1.00	0.00
03	1996STWFB048	Wildhorse Creek	—Dry—						

2.4.21.2 Water Quality and Pollutants**General Observations**

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-21:

1. All segments of ID17040220SK021_02 are ephemeral.
2. ID17040220SK021_03 has distinct perennial and ephemeral segments (Figure 106).
3. The source of the perennial flow in ID17040220SK021_03 is unknown. Although small in volume, this surface flow persisted through the summer. Surface flow begins at the head of the canyon near Wildhorse Road then continues south under Highway 20. Full infiltration of the summer flow occurs prior to the channel crossing at Old Highway 68.
4. Active beaver complexes exist at both upper and lower ends of the 3rd-order canyon.



Figure 106. ID17040220SK021_03, downstream/upstream, 7/15/2014.

Flow

Flows were collected for Wildhorse Creek at sampling location 17040220-21B, upstream of Highway 20. Although small in volume, the flow at this location persisted through all sampling visits in 2014 (Figure 107).

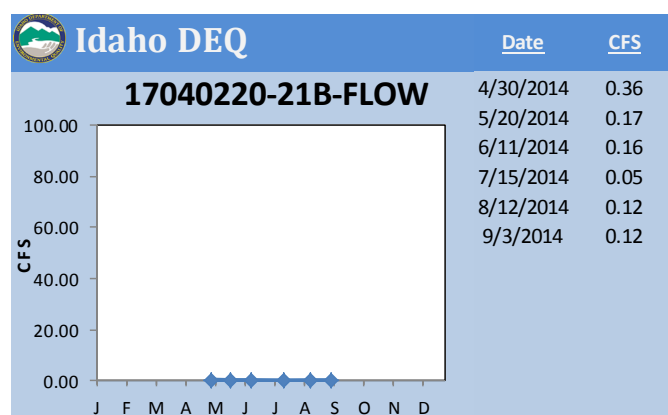


Figure 107. Flows at 17040220-21B, 2014.

Past Conditions

The 2005 Camas TMDL found that sediment, bacteria, and temperature were the pollutants of concern in Wildhorse Creek and that lack of flow and channelization were the largest impacts to beneficial uses (DEQ 2005, pg. 190).

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 108). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 144).



Figure 108. Sample site 17040220-21B, 6/11/2014 and 8/12/2014.

Table 144. Wildhorse Creek (US-21) water chemistry.

17040220-21A Wildhorse Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	Total Suspended Solids	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100mL	ft ³ /sec
4/22/2014	<0.010	<0.010	0.38	0.049	<5.0	< 1	0.399
17040220-21B Wildhorse Creek							
4/30/2014	--	--	--	--	--	--	0.358
5/20/2014	<0.010	0.15	0.23	0.02	<5.0	2.0	0.166
6/11/2014	<0.010	0.18	0.26	0.025	<5.0	135.4	0.155
7/15/2014	<0.010	0.28	0.15	0.028	<5.0	83.3	0.054
8/12/2014	0.012	0.24	0.14	0.035	<5.0	104.6	0.119
9/3/2014	<0.010	0.32	0.11	0.027	<5.0	1,584.8	0.117
10/27/2014	--	--	--	--	--	--	0.760

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-21B (and 21A) to represent nutrient discharge into downstream waters. This sample site (21B) is located on AU ID17040220SK021_03 immediately upstream of Highway 20. Nutrients specific to ID17040220SK021_02 were not reviewed in 2014.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 145). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 145. Wildhorse Creek (US-21) nutrient summary.

17040220-21B Wildhorse Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TN:TP Ratio	Limits ¹	TP Load ²
	mg/L	mg/L	mg/L			lbs/day
April (21A)	<0.010	0.380	0.049	8.0	N Limiting	0.002
May	0.15	0.23	0.02	19.0	P Limiting	0.001
June	0.18	0.260	0.025	17.6	P Limiting	0.000
July	0.28	0.150	0.028	15.4	--	--
August	0.24	0.140	0.035	10.9	--	--
September	0.32	0.110	0.027	15.9	--	--
¹ TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
² (TP [mg/l] *0.08982555)Flow [ft3/sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-21B (and 21A) to represent TSS discharge into downstream waters. TSS specific to ID17040220SK004_02 was not assessed in 2014. All samples produced very low results for TSS (Table 146).

Table 146. Wildhorse Creek (US-21) total suspended solids.

17040220-21B Wildhorse Creek			
Total Suspended Solids			
Sample Date	TSS	Flow	TSS Load ¹
	mg/L	ft3/sec	tons/year
April (21A)	<5.0	0.399	0.03
May	<5.0	0.166	0.01
June	<5.0	0.155	0.01
July	<5.0	0.054	0.00
August	<5.0	0.119	0.01
September	<5.0	0.117	0.01
¹ (TSS [mg/l] *0.016393163)Flow [ft3/sec] = TSS load [tons/year]			

E. coli

Sample analysis results for *E. coli* in Wildhorse Creek in 2014 are displayed in Table 147 and indicate one *E. coli* concentration above trigger values in September.

Table 147. Wildhorse Creek (US-21) *E. coli*.

17040220-21B Wildhorse Creek			
Bacteria			
Sample Date	<i>E. coli</i>	Flow	Trigger¹
	MPN/ 100mL	ft ³ /sec	
April (21A)	< 1	0.40	--
May	2.0	0.166	--
June	135.4	0.155	--
July	83.3	0.054	--
August	104.6	0.119	--
September	1584.8	0.117	PCR, SCR
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Temperature

A thermograph was deployed in this water body to capture hourly water temperature measurements. The temperature plot for 5/01/2014–10/26/2014 is displayed in Figure 109. The plot indicates that AU ID17040220SK021_03 has a few exceedances of the instantaneous numeric criteria of 22 °C for the CWAL beneficial use as defined in IDAPA 58.01.02.250.02.b during the measurement period. Analysis of this temperature data set confirms that the instantaneous criterion was exceeded 20% of evaluated days. However, only 2% of the evaluated days exceeded the daily average criteria of 19 °C.

The exceedance analysis summary is provided in Table 148, and a complete exceedance analysis is in Appendix A.

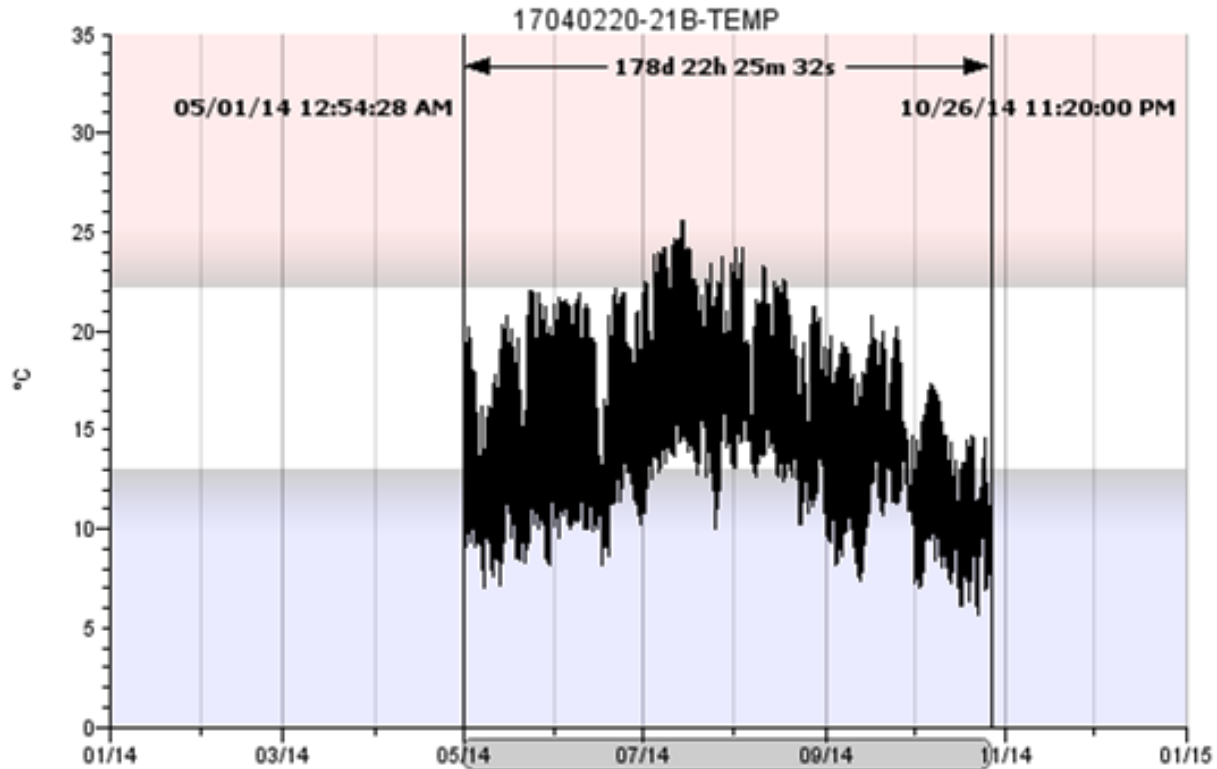


Figure 109. Wildhorse Creek (US-21) thermograph.

Table 148. Exceedances for site 17040220-21B, 5/01/2014–10/26/2014.

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prcnt	
22 °C Instantaneous	36	20%	
19 °C Average	3	2%	
Days Evaluated & Date Range	179	1-Jan	31-Dec

2.4.21.3 TMDL Targets, Loads, and Status

The 2005 Camas TMDL set heat load targets for US-21, Wildhorse Creek. Loading specific to AUs SK021_02 was not presented. Past load, current load, and current status for AU SK021_03 are displayed in Table 149.

Table 149. Wildhorse Creek (US-21) TMDL load summary and status.

AU	TMDL Pollutant	2005 Load ^a	2014 Loads ^b	TMDL Target ^c	Target Status ^d
ID17040220SK021_02	----- No TMDL -----				
ID17040220SK021_03	Sediment (t/yr)	46.5	.03	Load capacity 18.3 t/yr	Target achieved
			.01		
			.01	80% bank stability	Status unknown
			.00		
			.01		
	Bacteria [<i>E.coli</i>] (cfu/100ml.)	2,500 ^e	.01	Load capacity 576 cfu/100ml	Target exceeded
			<1		
			2		
			135.4		
			83.3		
	Temperature Solar Load ^f (kWh/day)	283,983	104.6	130,000 kWh/day	Target exceeded
			1584.8		
			260,000		
Varied segment % deficiencies			Shade % per segment	Target exceeded	
a. Loads identified in the 2005 Camas TMDL pgs. 201–205. b. Calculated from 2014 sampling results. c. TMDL targets prescribed in the 2005 Camas TMDL pgs. 190–194. d. Target status determined as described in this section’s narrative. e. The 2005 sediment load was calculated with erosion rate, bank height, and quantity of streambank stability. f. Loads and target status determined as described in the draft 2016 Camas Creek temperature PNV analysis.					

Sediment TMDL

The 2005 Camas TMDL states the following:

Sediment is impacting beneficial uses of Wildhorse Creek in the form of bed load sediment. Suspended sediment measured during drought years is not impacting water quality of the stream, however bed load sediment measured in the form of percent fines indicates that sediment is impacting water quality. A value greater than 35% for percent fines was used to indicate that sediment was impacting the water body. If this was the case then stream bank erosion inventories were completed to determine if stream bank erosion was the contributor of sediment impact. The target for stream bank erosion TMDLs is 80% bank stability. (DEQ 2005)

Sampling of US-21 in 2014 included analysis for TSS for Wildhorse Creek and yielded instantaneous loads as displayed in Table 146. Existing TSS loads are significantly lower than the sediment load identified in the 2005 Camas TMDL (46.5 tons/year). Although these numbers cannot be compared directly, the TSS numbers do show that the water column loads in this AU are relatively low.

Bacteria (*E. coli*) TMDL

The 2005 Camas TMDL states the following:

Bacteria are impacting the secondary contact recreation beneficial uses of Wildhorse Creek and are measured by *E. coli* values. According to Idaho Code 58.01.02.251.02a, waters with the secondary contact recreation use are not to exceed 576 colonies of *E. coli* organisms per 100ml of sample. If an exceedance of this value occurs then four additional samples have to be taken within a 30 day period and must not exceed a geometric mean of 126 cfu/100ml. As a result 576 colonies of organisms will be the target for the bacteria

TMDL on Wildhorse Creek. However, the geometric mean of 126 cfu/100ml will be the value used to determine compliance with the standards. (DEQ 2005)

Sampling in 2014 included analysis for *E. coli*. To review the performance of the TMDL, grab samples were collected monthly to indicate whether trigger values were exceeded (Table 147). The samples collected April through August found levels below beneficial use trigger values. However, sampling in September returned a probable *E. coli* organism concentration of 1,584.8 colonies per 100 mL, indicating the need for additional geometric sampling to confirm compliance with water quality standards. The performance of the TMDL to reduce this pollutant cannot be evaluated until geometric sampling is completed.

Temperature TMDL

A PNV analysis was completed for this water body in 2016 to re-evaluate segment shade targets and heat loading. As a result, updated existing loads and new total solar load targets are suggested as displayed in Table 150.

The existing shade for each segment was found to vary. Some segments meet or exceed the shade potential, and some segments are shade deficient. Based on the 2016 PNV shade analysis, thermograph data set, and discharge measurements across WBID US-21, the following conclusions are drawn for water temperature:

- The Wildhorse Creek thermograph is located in the perennial segment of this stream. The exceedance analysis reported that for the 179 days evaluated for CWAL support criteria, only 3 days (2%) of the daily averages were in excess. It is probable that these conditions are supporting CWAL in this AU.
- AU ID17040220SK021_03 is exceeding the heat loading target prescribed in the 2016 Camas PNV analysis. However, the condition of greatest impairment to the beneficial uses in this AU appears to be the ephemeral (dry) regime in certain segments, rather than solar loading.

Table 150. Wildhorse Creek (US-21) heat load summary.

US-21; Wildhorse Creek			
PNV Temperature Loads ¹			
AU	Target	Existing	Excess
	kWh/day	kWh/day	kWh/day
021_03	130,000	260,000	130,000

¹ Solar loading from draft 2014 PNV Temperature TMDL.

2.4.22 Malad River (US-22)

For an overview of this WBID, see Figure 110.

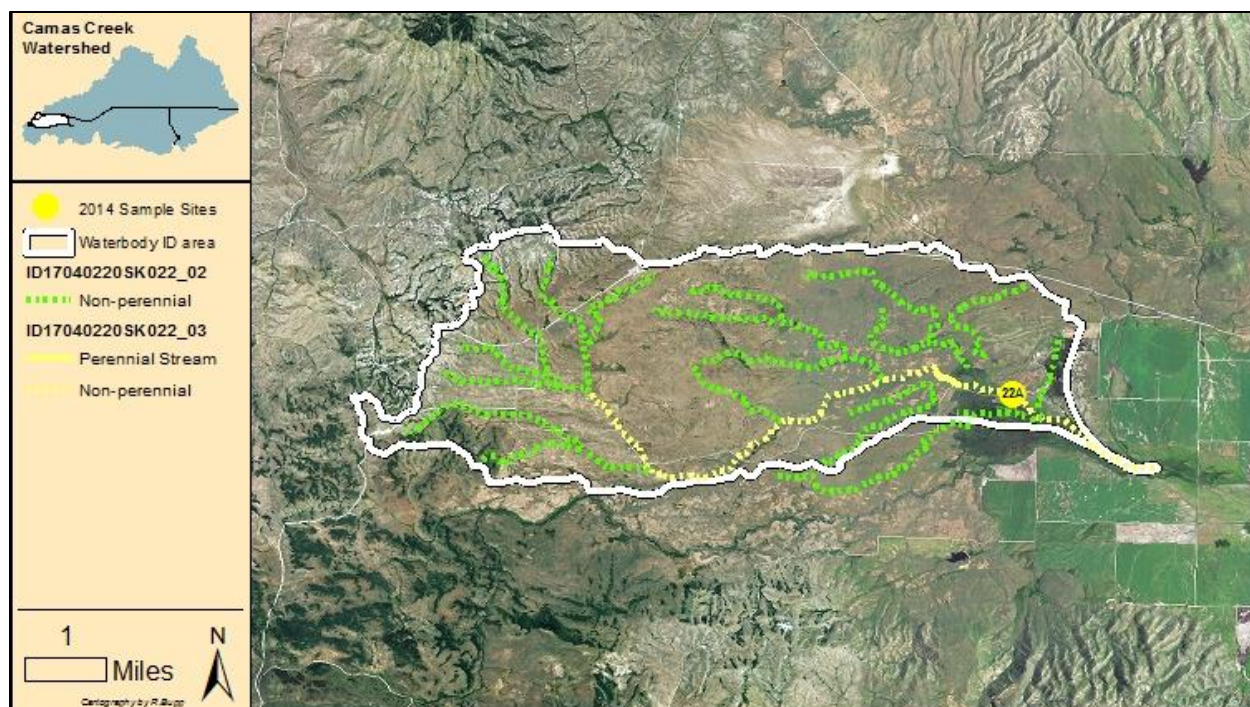


Figure 110. WBID US-22, Malad River – source to mouth.

2.4.22.1 Assessment Units

AU ID17040220SK022_02 includes the 1st- and 2nd-order tributaries contributing to the 3rd-order of Malad River, totaling 36.32 miles. Segments are ephemeral, mostly exhibiting flows in direct response to snowmelt and precipitation events.

AU ID17040220SK022_03 is the 3rd-order of Malad River contributing to the 3rd-order of Camas Creek, totaling 8.75 miles. The upper and lower extents of this segment are ephemeral. A short reach in the middle of the 3rd-order channel maintains perennial flow due to a spring at the base of the west-end slopes (Table 151).

Table 151. Malad River (US-22) assessment units.

Idaho's 2012 Integrated Report			AU	Stream Segment
Category 2: Full Support			ID17040220SK022_02	Malad River – 1st and 2nd order 36.32 MILES
			ID17040220SK022_03	Malad River – 3rd order 8.75 MILES
Beneficial Use	_02	_03	Causes	Reference
Primary contact recreation	NA	—		
Secondary contact recreation	FS	FS		
Agricultural water supply	NA	NA		
Industrial water supply	NA	NA		
Wildlife habitat	NA	NA		
Aesthetic	NA	NA		

Beneficial Use Comments**Secondary Contact Recreation**

5/6/2012 (HS) - DEQ's Boise Region collected an E. coli sample from the second order section of Malad River on 5/12/2011. The result was 41 CFU/100ml, which is below the threshold for repeat sampling. This creek therefore fully supports secondary contact recreation.

AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	2006SBOIA007	Malad River							—Dry—
02	2014STWFA047	Malad River							—Dry—
03	2001STWFA046	Malad River							—Dry—

2.4.22.2 Water Quality and Pollutants**General Observations**

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-22:

1. All stream reaches in ID17040220SK022_02 are ephemeral.
2. The upper and lower extents of ID17040220SK022_03 are ephemeral.
3. The middle portion of ID17040220SK022_03 maintains perennial flow due to a spring at the base of the west-end slopes. During the growing season, this flow is 100% diverted for irrigation (Figure 111). Except during spring runoff, undiverted flow infiltrates to ground water prior to reaching Camas Creek.



Figure 111. Malad River diversion, 7/15/2014.

Flow

Flows were measured for the Malad River at sampling location 17040220-22A. This site is at the Old Highway 68 crossing and is downstream of the diversion (Figure 112).

Flow was present at 17040220-22A in April only, at 0.24 cfs. All subsequent visits provided no-flow or dry conditions.

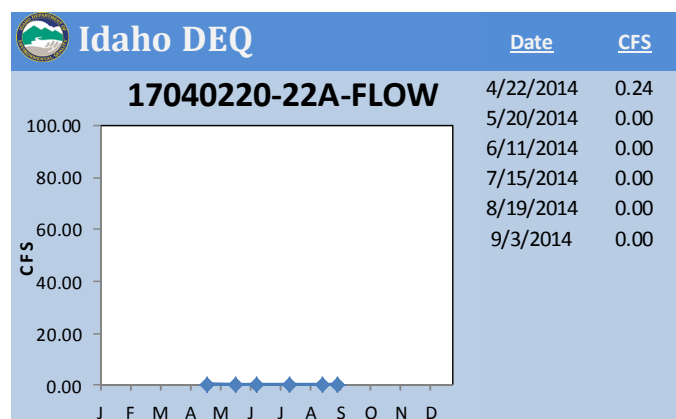


Figure 112. Flow at 17040220-22A, 2014.

Past Conditions

The 2005 Camas TMDL did not disclose any information specific to the water quality or beneficial uses for US-22.

Current Conditions

DEQ visited this water body from April 2014 through September 2014 (Figure 113). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 152).



Figure 113. Sample site 17040220-22A, 4/22/2014 and 6/11/2014.

Table 152. Malad River (US-22) water chemistry.

17040220-22A Malad River							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	Total Suspended Solids	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100mL	ft ³ /sec
4/22/2014 ¹	<0.010	<0.010	0.45	0.063	5	24.6	0.241
5/20/2014	--	--	--	--	--	--	no flow
6/11/2014	--	--	--	--	--	--	no flow
7/15/2014	--	--	--	--	--	--	no flow
8/19/2014	--	--	--	--	--	--	no flow
9/3/2014	--	--	--	--	--	--	no flow

1. Hydrophytic vegetation indicates shallow water table. Stream may act more as a wetland at this location although channel morphology is present. Upstream irrigation is in progress for pasture flooding below corrals.

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-22A to represent nutrient discharge into downstream waters. This site is located at the Old Highway 68 crossing.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 153). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 153. Malad River (US-22) nutrient summary.

17040220-22A Malad River						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TN:TP Ratio	Limits ¹	TP Load ²
	mg/L	mg/L	mg/L			lbs/day
April	<0.010	0.45	0.063	7.3	N Limiting	0.001
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--
¹ TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting ² (TP [mg/l] * 0.08982555)Flow [ft3/sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS (Table 154). Samples were collected at location 17040220-22A to represent TSS discharge into downstream waters.

Table 154. Malad River (US-22) total suspended solids.

17040220-22A Malad River			
Total Suspended Solids			
Sample Date	TSS	Flow	TSS Load ¹
	mg/L	ft3/sec	tons/year
April	5	0.241	0.02
May	--	no flow	--
June	--	no flow	--
July	--	no flow	--
August	--	no flow	--
September	--	no flow	--
¹ (TSS [mg/l] * 0.016393163)Flow [ft3/sec] = TSS load [tons/year]			

E. coli

Sample analysis results for *E. coli* in 2014 in the Malad River are displayed in Table 155 and do not indicate any *E. coli* concentrations above trigger values.

Table 155. Malad River (US-22) *E. coli*.

17040220-22A Malad River			
Bacteria			
Sample Date	<i>E. coli</i>	Flow	Trigger¹
	MPN/100mL	ft ³ /sec	
April	24.6	0.24	--
May	--	no flow	--
June	--	no flow	--
July	--	no flow	--
August	--	no flow	--
September	--	no flow	--

¹ > 406cfu/100ml for Primary Contact Recreation
> 576 cfu/100ml for Secondary Contact Recreation

Temperature

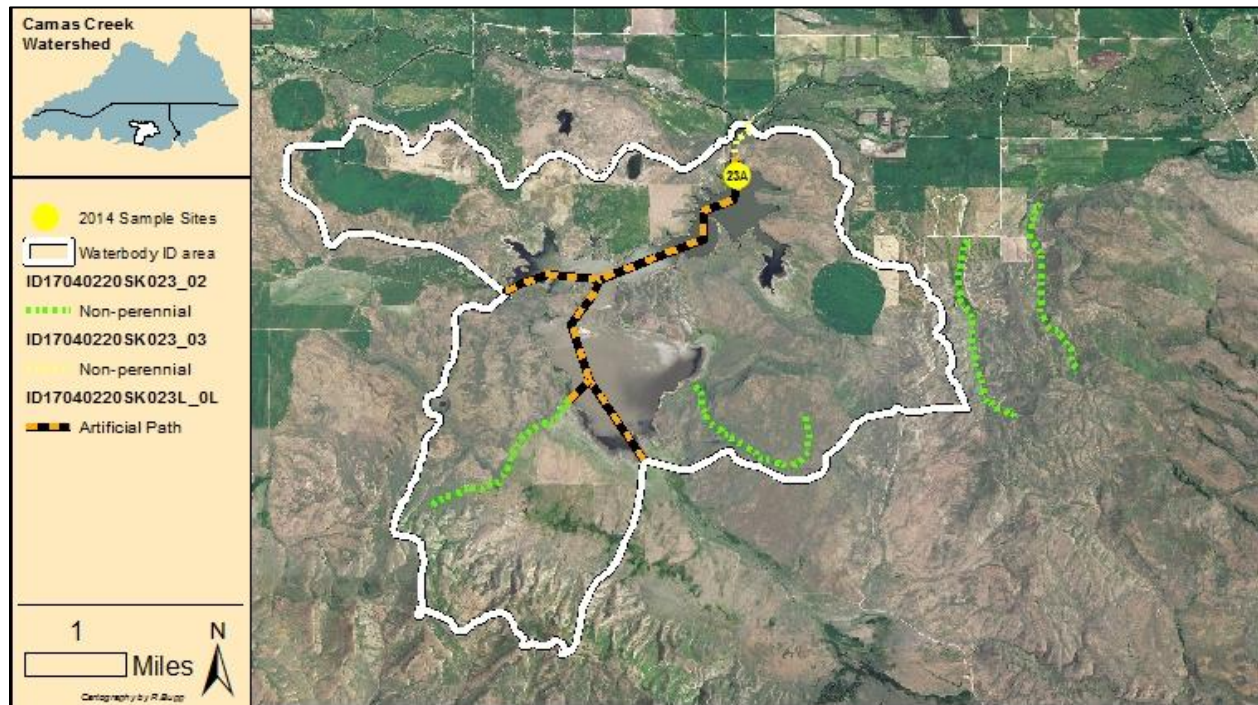
No historic or current temperature data exist for US-22.

2.4.22.3 TMDL Targets, Loads, and Status

No TMDLs were developed for the AUs in this water body.

2.4.23 Mormon Reservoir (US-23)

For an overview of this WBID, see Figure 114.

**Figure 114. WBID US-23, Mormon Reservoir.**

2.4.23.1 Assessment Units

AU ID17040220SK023_02 includes the 1st- and 2nd-order tributaries contributing to Mormon Reservoir, totaling 7.74 miles. Segments are ephemeral, exhibiting flows in direct response to snowmelt and precipitation events.

AU ID17040220SK023_03 is the 3rd-order of McKinney Creek. This segment begins at the spillway of Mormon Reservoir and continues 0.44 miles to the 5th-order of Camas Creek. This segment only flows when Mormon Reservoir discharges over the spillway.

AU ID17040220SK023L_0L is Mormon Reservoir, which impounds the lower channels and confluence of Dairy Creek (US-24) and McKinney Creek (US-25). At full capacity, the reservoir surface area is 1,583.81 acres (Table 156).

Beneficial Use Comments

None Listed

Cause Comments**Mercury**

2/22/2010 (NED) - A mercury level of 0.33 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported from the fish tissue samples collected in April 2007.

Other flow regime alterations

Flow alterations are not a pollutant but rather pollution. Mormon Reservoir will remain listed as impaired by flow alteration as noted on pg 157 Camas Creek Subbasin Assessment.

Table 156. Mormon Reservoir (US-23) assessment units.

Idaho's 2012 Integrated Report				AU	Stream Segment				
Category 3: Unassessed Waters				ID17040220SK023_02	Unnamed Tributaries near Mormon Reservoir 7.74 MILES				
				ID17040220SK023_03	Unnamed Tributaries to Mormon Reservoir 0.44 MILES				
Category 4a: Impaired Waters with approved TMDLs				ID17040220SK023L_0L	Mormon Reservoir 1583.81 ACRES				
Category 4c: Waters Impaired by Pollution				ID17040220SK023L_0L	Mormon Reservoir 1583.81 ACRES				
Category 5 (§303(d))				ID17040220SK023L_0L	Mormon Reservoir 1583.81 ACRES				
Beneficial Use		_02	_03	_0L	Causes		Reference		
Cold water aquatic life		NA	NA	NS	Sedimentation/Siltation Other flow regime alterations		ADB: Assessed 3/25/2008 TMDL: Flow alteration (pg. 157)		
Primary contact recreation		—	NA	FS					
Secondary contact recreation		—	—	NS	Mercury		ADB: Assessed 3/25/2008		
Domestic water supply		—	NA	—					
Agricultural water supply		NA	NA	NA					
Industrial water supply		NA	NA	NA					
Wildlife habitat		NA	NA	NA					
Aesthetic		NA	NA	NA					
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
03	2012STWFA066	McKinney Creek	—Dry—						

2.4.23.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-23:

1. All stream segments comprising AU ID17040220SK023_02 are ephemeral.
2. ID17040220SK023_03 is episodic and augmented by conditions in Mormon Reservoir. This AU is the historic channel of McKinney Creek, now the spillway for the reservoir.
3. ID17040220SK023L_0L is Mormon Reservoir. The primary purpose for this reservoir is irrigation storage, with recreation occurring if water levels are sufficient. There is no limitation for drawdown or minimum depth required; thus, this reservoir is often dry during late irrigation season (Figure 115).

4. Mercury was found to exceed the fish tissue criterion in samples collected from Mormon Reservoir in 2007.



Figure 115. Mormon Reservoir, 7/09/2014. Water level is below the reservoir drain with only a shallow puddle remaining.

Flow

Surface flow is not a parameter appropriate to describe conditions in a reservoir. Quantitative flow information is not available for the unnamed tributaries to the reservoir.

Past Conditions

The below excerpts are from the 2005 Camas TMDL:

Through the subbasin assessment process, the following have been identified about Mormon Reservoir:

- Mormon Reservoir does not have enough pool volume to stratify
- Bacteria (*E. coli*) are not impacting the primary contact beneficial uses of the reservoir
- Sediment (TSS and Secchi depth) is impacting water quality
- Nutrients (TP and TIN) are impacting water quality
- Temperature and DO(dissolved oxygen)are data gaps

As a result of the subbasin assessment, Mormon reservoir will remain listed as impaired by flow alteration, sediment nutrients, DO, and temperature...

...The reservoir is also being delisted as being impacted by bacteria. (DEQ 2005, pg. 157)

Current Conditions

DEQ visited this water body for sampling from April 2014 through September 2014 (Figure 116). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli* (Table 157).



Figure 116. Mormon Reservoir looking southeast from the dam, 6/10/2014 and 9/10/2014.

Table 157. Mormon Reservoir (US-23) water chemistry.

17040220-23A Mormon Reservoir							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	Total Suspended Solids	E. coli	Reservoir Condition
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100 mL	
4/23/2014	0.69	0.60	3.0	0.52	14	4.1	choppy, low
5/12/2014	0.45	0.69	3.2	0.62	17	7.4	choppy, low
6/10/2014	0.019	0.38	2.1	1.10	130	31.3	choppy, low
7/9/2014	--	--	--	--	--	--	dry
8/20/2014	--	--	--	--	--	--	dry
9/10/2014	--	--	--	--	--	--	dry

Extreme low water levels during 2014 sampling presented conditions that are unique to shallow, impounded reservoirs. These conditions should not be considered representative of this water body at full or near-full levels.

2.4.23.3 TMDL Targets, Loads, and Status

No TMDLs were developed for the AUs in this water body.

2.4.24 Dairy Creek (US-24)

For an overview of this WBID, see Figure 117.

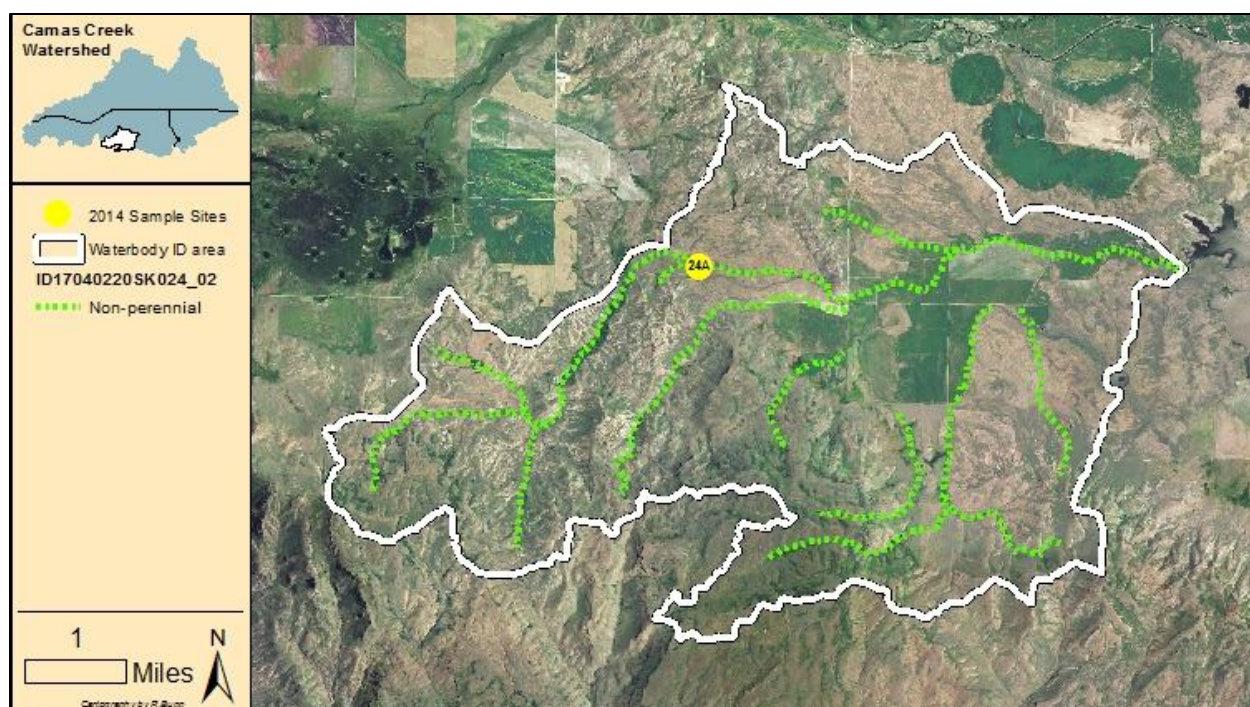


Figure 117. WBID US-24, Dairy Creek – source to Mormon Reservoir.

2.4.24.1 Assessment Units

AU ID17040220SK024_02 includes the 1st-order tributaries and 2nd-order main channel of Dairy Creek contributing to Mormon Reservoir, totaling 28.43 miles. All segments are ephemeral, exhibiting flows in direct response to snowmelt and precipitation events (Table 158).

Table 158. Dairy Creek (US-24) assessment unit.

Idaho's 2012 Integrated Report			AU		Stream Segment					
Category 4a: Impaired Waters with approved TMDLs			ID17040220SK024_02			Dairy Creek – source to Mormon Reservoir 28.43 MILES				
Beneficial Use		_02	Causes			Reference				
Cold water aquatic life		NS	Phosphorus (Total) Sedimentation/Siltation			ADB: Assessed 11/28/2002 TMDL (pg. 197): Streambank erosion. Nutrient delivery to reservoir				
Primary contact recreation		NA								
Agricultural water supply		NA								
Industrial water supply		NA								
Wildlife habitat		NA								
Aesthetic		NA								
AU order	BURP ID	Stream	SMI		SFI		SHI		Average	
			Score	Rtng	Score	Rtng	Score	Rtng		
—No BURP sites—										

2.4.24.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a couple notable factors that drive the water quality conditions within WBID US-24:

1. All stream segments comprising AU ID17040220SK024_02 are ephemeral.
2. Dairy Creek flow-connects to Mormon Reservoir only during periods of extreme runoff. Spring runoff in 2014 did not produce a volume sufficient to contribute to Mormon Reservoir (Figure 118). Normally, Dairy Creek flows infiltrate prior to reaching the reservoir.



Figure 118. Dairy Creek near Mormon Reservoir, 4/22/2014.

Flow

Flow was measured for Dairy Creek at sampling location 17040220-24A at the western Barron Lane crossing. This site produced measurable flow only during two visits in April 2014. All subsequent visits yielded a dry channel (Figure 119).

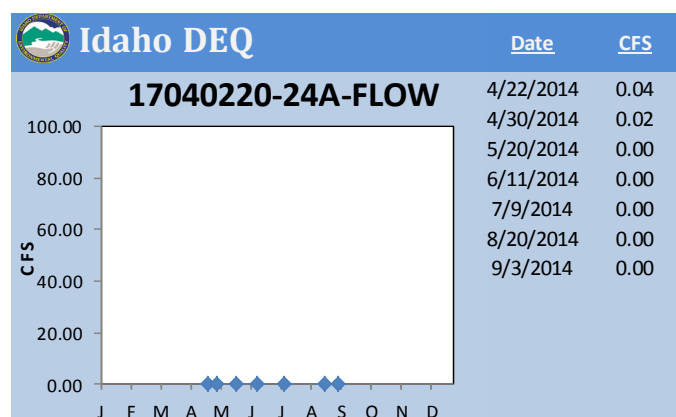


Figure 119. Flow at 17040220-24A, 2014.

Past Conditions

The 2005 Camas TMDL states the following regarding Dairy Creek:

Through the subbasin assessment process, it has been identified that the water quality of Dairy Creek is being impacted by a pollutant as well as impacting the water Quality of Mormon Reservoir. The pollutant of concern in the water body has been found to be sediment. Nutrients are a pollutant to Mormon Reservoir and as Dairy Creek is delivering an excessive load of nutrients to the reservoir a nutrient TMDL is being completed to restore water quality of the reservoir. (DEQ 2005, pg. 197)

Current Conditions

DEQ visited this water body for sampling from April 2014 through September 2014 (Figure 120). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 159).



Figure 120. 17040220-24A, 5/20/2014 and 9/03/2014.

Table 159. Dairy Creek (US-24) water chemistry.

17040220-24A Dairy Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	Total Suspended Solids	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100 mL	ft ³ /sec
4/22/2014	<0.010	<0.010	0.49	0.092	<5.0	1.0	0.038
4/30/2014	--	--	--	--	--	--	0.021
5/20/2014	--	--	--	--	--	--	dry
6/11/2014	--	--	--	--	--	--	dry
7/9/2014	--	--	--	--	--	--	dry
8/20/2014	--	--	--	--	--	--	dry
9/3/2014	--	--	--	--	--	--	dry

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. This sample was collected at location 17040220-024A in attempt to represent nutrient discharge into downstream waters. This sample site is located at the western Barron Lane crossing.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated (Table 160). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 160. Dairy Creek (US-24) nutrient summary.

17040220-24A Dairy Creek						
Sample Month	Nutrients			TN:TP Ratio	Limits ¹	TP Load ²
	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus			
	mg/L	mg/L	mg/L			lbs/day
April	<0.010	0.49	0.092	5.4	N Limiting	0.000
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--

¹ TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting
² (TP [mg/l] *0.08982555)Flow [ft3/sec] = TP load [lbs/day]

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS (Table 161). Samples were collected at location 17040220-024A in an attempt to represent TSS discharge into downstream waters.

Table 161. Dairy Creek (US-24) total suspended solids.

17040220-24A Dairy Creek			
Total Suspended Solids			
Sample Date	TSS	Flow	TSS Load ¹
	mg/L	ft3/sec	tons/year
April	<5.0	0.038	0.00
May	--	dry	--
June	--	dry	--
July	--	dry	--
August	--	dry	--
September	--	dry	--

¹ (TSS [mg/l] *0.016393163)Flow [ft3/sec] = TSS load [tons/year]

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-24A are displayed in Table 162 and do not indicate any *E. coli* concentrations above trigger values.

Table 162. Dairy Creek (US-24) *E. coli*.

17040220-24A Dairy Creek Bacteria			
Sample Date	<i>E. coli</i>	Flow	Trigger¹
	MPN/ 100mL	ft³/sec	
April	1.0	0.04	--
May	--	dry	--
June	--	dry	--
July	--	dry	--
August	--	dry	--
September	--	dry	--

¹ > 406cfu/100ml for Primary Contact Recreation
> 576 cfu/100ml for Secondary Contact Recreation

Temperature

No historic or current temperature data exist for US-24.

2.4.24.3 TMDL Targets, Loads, and Status

The 2005 Camas TMDL set sediment and nutrient load targets for US-24, Dairy Creek. Past loads, current loads, and current status are displayed in Table 163.

Table 163. Dairy Creek (US-24) TMDL load summary and status.

AU	TMDL Pollutant	2005 Load^a	2014 Loads^b	TMDL Target^c	Target Status^d
ID17040220SK024_02	Nutrients (lb/day TP)	2.75	0.00	Load capacity 1.62 lb/day	Target achieved
				Max. conc. 0.050 mg/L	Target exceeded
	Sediment (t/yr)	1,677.2 ^e	0.00	Load capacity 52.2 t/yr	Target achieved
				80% bank stability	Status unknown

a. Loads identified in the 2005 Camas TMDL pgs. 197–201.
b. Calculated from 2014 sampling results.
c. TMDL targets prescribed in the 2005 Camas TMDL pgs. 197–201.
d. Target status determined as described in this section's narrative.
e. The 2005 sediment load was calculated with erosion rate, bank height, and quantity of streambank stability.

Sediment TMDL

The 2005 Camas TMDL states the following:

Sediment is impacting the water quality of Dairy Creek in the form of bed load sediment. Suspended sediment measured during drought years is not impacting water quality of the stream, however bed load sediment measured in the form of percent fines indicates that sediment is impacting water quality. A value greater than 35% for percent fines was used to indicate that sediment was impacting the water body. If this was the case then stream bank erosion inventories were completed to determine if stream bank erosion was the contributor of sediment impact. The target for stream bank erosion TMDLs is 80% bank stability.

The sampling of US-24 included analysis for TSS for Dairy Creek. The results show that the instantaneous load is negligible (Table 161). The existing TSS load is significantly lower than the sediment load identified in the 2005 Camas TMDL (1,677.2 tons/year). Although these numbers cannot be compared directly, the TSS numbers do show that the water column loads in this AU are relatively low.

No data to evaluate percent fines or current bank stability are available.

Nutrient TMDL

The 2005 Camas TMDL states the following:

Nutrients are not impacting the water quality of Dairy Creek, but as the creek discharges into a reservoir the TMDL is completed to limit nutrient delivery. The target for water bodies discharging into a storage system is 0.050 mg/L. This goal should aid limiting excessive delivery of nutrients to the reservoir. As a result 0.050 mg/L is the target to be used in the development of a nutrient TMDL for Dairy Creek.

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. To review the performance of the TMDL, an instantaneous daily load for TP was calculated for the single sample event (Table 164). This daily load is significantly lower than the load capacity in the TMDL (2.7 lb/day), and the concentrations were higher than the TMDL maximum of 0.050 mg/L. For these reasons, the TP load is far below the daily load capacity in Dairy Creek but exceeds the target TMDL concentration.

Table 164. Dairy Creek (US-24) total phosphorus loads.

17040220-24A Dairy Creek			
Total Phosphorus			
Sample Date	TP	Flow	TP Load¹
	mg/L	ft ³ /sec	tons/year
April	0.092	0.038	0.000
May	--	dry	--
June	--	dry	--
July	--	dry	--
August	--	dry	--
September	--	dry	--

¹ (TP [mg/l] *0.08982555)Flow [ft³/sec] = TP load [lbs/day]

2.4.25 McKinney Creek (US-25)

For an overview of this WBID, see Figure 121.

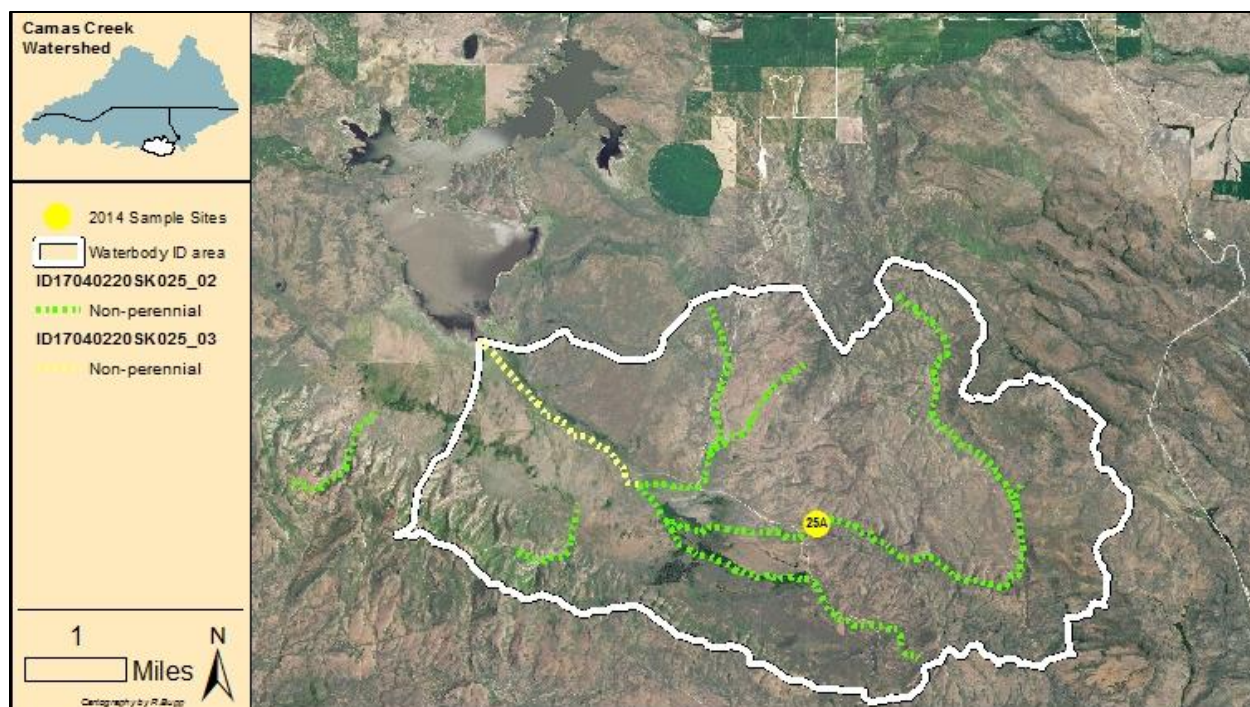


Figure 121. WBID US-25, McKinney Creek – source to Mormon Reservoir.

2.4.25.1 Assessment Units

AU ID17040220SK025_02 includes the 1st- and 2nd-order tributaries contributing to the 3rd-order of McKinney Creek, totaling 17.49 miles. Segments are ephemeral, flowing only in response to snowmelt and precipitation events.

AU ID17040220SK025_03 is the 3rd-order of McKinney Creek, which contributes to Mormon Reservoir, totaling 2.26 miles. This segment is ephemeral (Table 165).

Table 165. McKinney Creek (US-25) assessment units.

Idaho's 2012 Integrated Report			AU		Stream Segment				
Category 4a: Impaired Waters with approved TMDLs			ID17040220SK025_02		McKinney Creek – source to Mormon Reservoir 17.49 MILES				
			ID17040220SK025_03		McKinney Creek – source to Mormon Reservoir 2.26 MILES				
Category 4c: Waters Impaired by Pollution			ID17040220SK025_02		McKinney Creek – source to Mormon Reservoir 17.49 MILES				
Beneficial Use		_02	_03	Causes			Reference		
Cold water aquatic life		NS	NS	Sedimentation/Siltation Low flow alterations			ADB: SK025_02 assessed 11/15/2004 SK025_03 assessed 09/13/2002 TMDL: Streambank erosion, lack of shade (pg. 194)		
Agricultural water supply		NA	NA						
Industrial water supply		NA	NA						
Wildlife habitat		NA	NA						
Aesthetic		NA	NA						
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
02	1993STWFA013	McKinney Creek	23.80	0.00	—	—	10.00	1.00	0.00
02	2012STWFA065	UNT to McKinney Creek	—Dry—						

2.4.25.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-25:

1. All stream segments comprising AU ID17040220SK025_02 are ephemeral.
2. AU ID17040220SK025_03 is ephemeral.
3. McKinney Creek flow-connects to Mormon Reservoir only during periods of extreme runoff. Spring runoff in 2014 did not produce a volume sufficient to contribute to Mormon Reservoir. Normally, McKinney Creek flows infiltrate prior to reaching the reservoir.
4. A short (0.25 mile) segment in AU ID17040220SK025_02 is spring-fed and exhibited perennial conditions in 2014. Sample site 17040220-25A is located in this reach. This flow infiltrates prior to reaching Fir Grove Road. Results from this sampling are representative only of this specific spring-fed reach, and not of the AU or WBID.

Flow

Flow was measured for McKinney Creek at sampling location 17040220-25A, 200 meters upstream of the Fir Grove Road crossing (Figure 122). Water at this site was locally spring-fed and infiltrated a short distance downstream. This was the only surface flow present in this WBID during the 2014 sampling effort and is not representative of the entire water body.

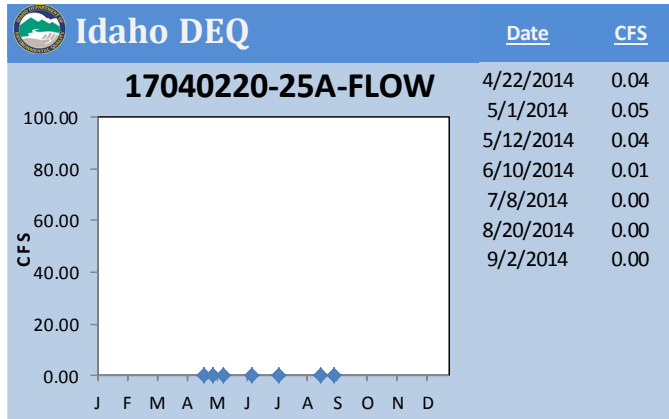


Figure 122. Flow at 17040220-25A, 2014.

Past Conditions

The 2005 Camas TMDL found that sediment was the pollutant of concern in McKinney Creek and lack of flow was also an impact to beneficial uses (DEQ 2005, pg. 194).

Current Conditions

DEQ visited this sampling location from April 2014 through September 2014 (Figure 123). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 166).



Figure 123. 17040220-25A, 5/01/2014 and 9/02/2014.

Table 166. McKinney Creek (US-25) water chemistry.

17040220-25A McKinney Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	Total Suspended Solids	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100 mL	ft ³ /sec
4/22/2014	<0.010	<0.010	0.41	0.05	<5.0	2.0	0.041
5/1/2014	--	--	--	--	--	--	0.047
5/12/2014	0.011	<0.010	0.38	0.046	<5.0	2.0	0.038
6/10/2014	<0.010	<0.010	0.27	0.029	<5.0	65.0	0.007
7/8/2014	--	--	--	--	--	--	no flow
8/20/2014	--	--	--	--	--	--	no flow
9/2/2014	--	--	--	--	--	--	no flow

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-25A, 200 meters upstream of the Fir Grove Road crossing. To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated (Table 167). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 167. McKinney Creek (US-25) nutrient summary.

17040220-25A McKinney Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TN:TP Ratio	Limits ¹	TP Load ²
	mg/L	mg/L	mg/L			lbs/day
April	<0.010	0.41	0.05	8.4	N Limiting	0.000
May	<0.010	0.38	0.046	8.5	N Limited	0.000
June	<0.010	0.27	0.029	9.7	N Limited	0.000
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--

¹ TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting
² (TP [mg/l] * 0.08982555) Flow [ft³/sec] = TP load [lbs/day]

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-25A, 200 meters upstream of the Fir Grove Road crossing (Table 168). This was the only surface flow present in this WBID during the 2014 sampling effort and is not representative of TSS in the entire water body.

Table 168. McKinney Creek (US-25) total suspended solids.

17040220-25A McKinney Creek Total Suspended Solids			
Sample Date	TSS	Flow	TSS Load¹
	mg/L	ft ³ /sec	tons/year
April	<5.0	0.041	0.00
May	<5.0	0.038	0.00
June	<5.0	0.007	0.00
July	--	no flow	--
August	--	no flow	--
September	--	no flow	--
¹ (TSS [mg/l] *0.016393163)Flow [ft ³ /sec] = TSS load [tons/year]			

E. coli

Sample analysis results for *E. coli* in 2014 at 17040220-25A are displayed in Table 169 and do not indicate any *E. coli* concentrations above trigger values.

Table 169. McKinney Creek (US-25) *E. coli*.

17040220-25A McKinney Creek Bacteria			
Sample Date	<i>E. coli</i>	Flow	Trigger¹
	MPN/ 100mL	ft ³ /sec	
April	2.0	0.041	--
May	2.0	0.038	--
June	65.0	0.007	--
July	--	no flow	--
August	--	no flow	--
September	--	no flow	--
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Temperature

A thermograph was deployed in this water body to capture hourly water temperature measurements. The temperature plot for 5/02/2014–7/07/2014 is displayed in Figure 124. The plot indicates that this location has a few exceedances of the instantaneous numeric criteria of 22 °C for the CWAL beneficial use as defined in IDAPA 58.01.02.250.02.b during the measurement period. Analysis of this temperature data set confirms that the instantaneous criterion was exceeded 17 days (25%) of the 67 days measured. However, no daily average exceeded the criteria of 19 °C during the measurement period.

A summary of this analysis is in Table 170. A complete exceedance analysis is in Appendix A.

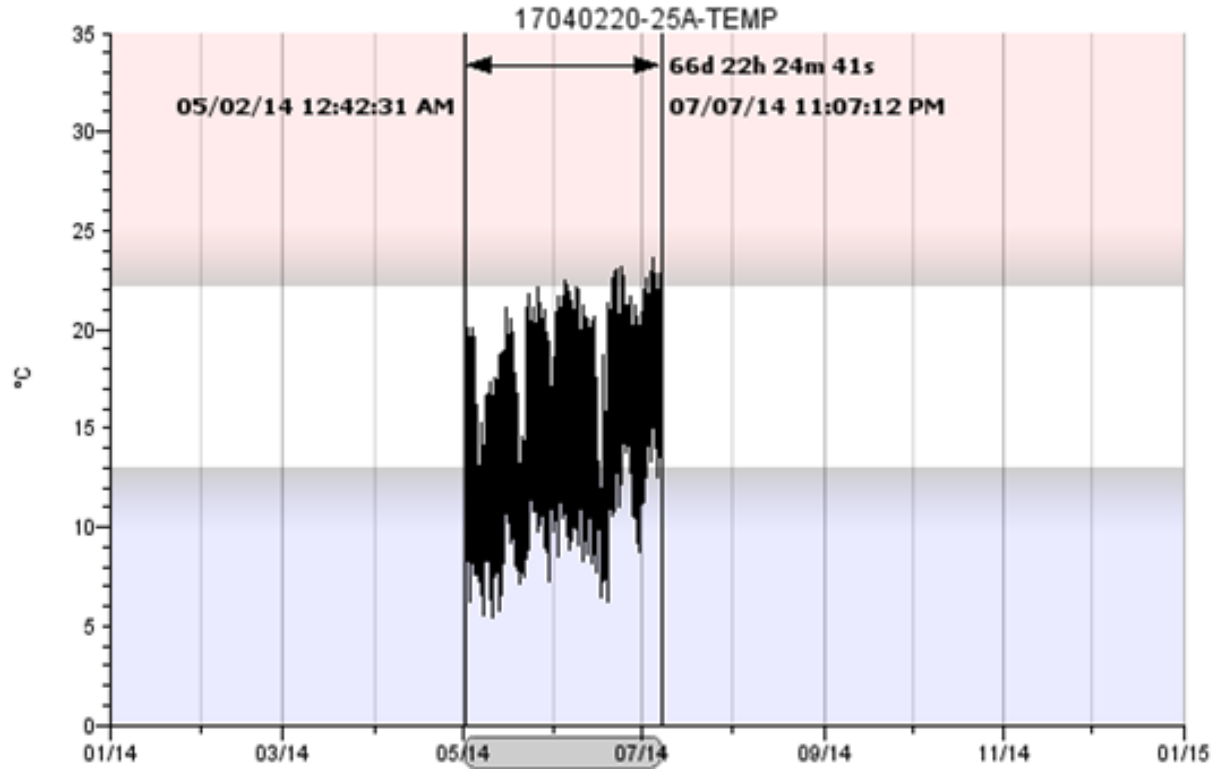


Figure 124. McKinney Creek (US-25) thermograph.

Table 170. Exceedances for site 17040220-25A, 5/02/2014–7/07/2014.

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prcnt	
22 °C Instantaneous	17	25%	
19 °C Average	0	0%	
Days Evaluated & Date Range	67	1-Jan	31-Dec

2.4.25.3 TMDL Targets, Loads, and Status

The 2005 Camas TMDL set sediment load targets for US-25. Past loads, current loads, and current status are displayed in Table 171.

Table 171. McKinney Creek (US-25) TMDL load summary and status.

AU	TMDL Pollutant	2005 Load ^a	2014 Loads ^b	TMDL Target ^c	Target Status ^d
ID17040220SK025_02 ID17040220SK025_03	Sediment (t/yr)	646.6 ^e	0.00	Load capacity 72.4 t/yr 80% bank stability	Target achieved Status unknown
a. Loads identified in the 2005 Camas TMDL pgs. 194–197. b. Calculated from 2014 sampling results. c. TMDL targets prescribed in the 2005 Camas TMDL pgs. 194–197. d. Target status determined as described in this section’s narrative. e. The 2005 sediment load was calculated with erosion rate, bank height, and quantity of streambank stability.					

Sediment TMDL

The 2005 Camas TMDL states the following:

Sediment is impacting the beneficial uses of McKinney Creek in the form of bed load sediment. Suspended sediment measured during drought years is not impacting water quality of the stream, however bed load sediment measured in the form of percent fines indicates that sediment is impacting water quality. A value greater than 35% for percent fines was used to indicate that sediment was impacting the water body. If this was the case then stream bank erosion inventories were completed to determine if stream bank erosion was the contributor of sediment impact. The target for stream bank erosion TMDLs is 80% bank stability.

Sampling at 17040220-25A included analysis for TSS for McKinney Creek. Results show that the instantaneous load is negligible (Table 168). The existing TSS load is significantly lower than the sediment target load identified in the 2005 Camas TMDL (72.4 tons/year). Although these numbers cannot be compared directly, the TSS numbers do show that the water column loads in this AU are relatively low.

2.4.26 Spring Creek (US-26)

For an overview of this WBID, see Figure 125.

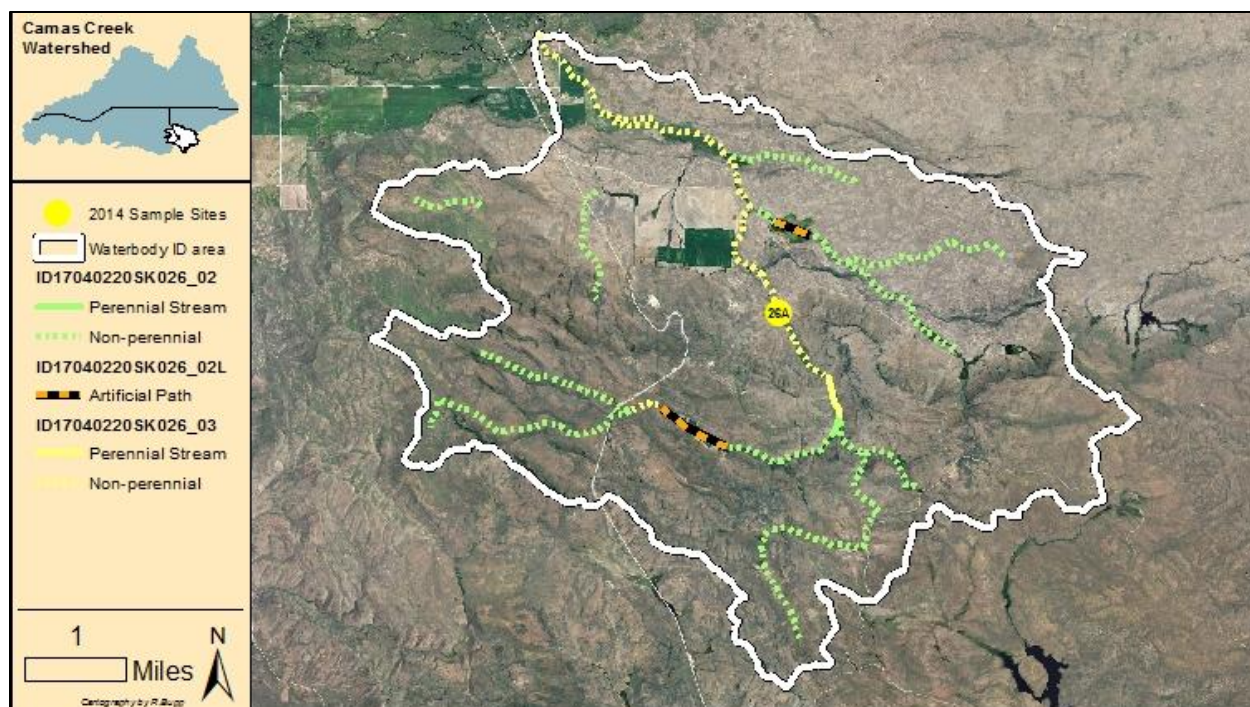


Figure 125. WBID US-26, Spring Creek – source to mouth.

2.4.26.1 Assessment Units

AU ID17040220SK026_02 includes the 1st- and 2nd-order tributaries contributing to the 3rd-order of Spring Creek, totaling 17.82 miles. Segments are mostly ephemeral, exhibiting flows in direct response to snowmelt and precipitation events. A short perennial reach exists near the beginning of the 3rd-order channel.

AU ID17040220SK026_02L is the Spring Creek Reservoir, which has a surface capacity of 110.74 acres. This reservoir is a shallow storage reservoir that was historically used to supply irrigation water downstream. The irrigation system is abandoned.

AU ID17040220SK026_03 is the 3rd-order of Spring Creek, which contributes to the 5th-order of Camas Creek and totals 6.40 miles. This AU is mostly ephemeral, as the surface flow ceases mid-summer. However, perennial water does remain in the upper extent of the 3rd-order channel as a result of beaver pond complexes (Table 172).

Table 172. Spring Creek (US-26) assessment units.

Idaho's 2012 Integrated Report				AU		Stream Segment			
Category 3: Unassessed Waters				ID17040220SK026_02		Spring Creek Complex 17.82 MILES			
				ID17040220SK026_02L		Spring Creek Reservoir 110.74 ACRES			
				ID17040220SK026_03		Spring Creek Complex 6.4 MILES			
Beneficial Use		_02	_02L	_03	Causes		Reference		
Agricultural water supply		NA	NA	NA					
Industrial water supply		NA	NA	NA					
Wildlife habitat		NA	NA	NA					
Aesthetic		NA	NA	NA					
AU order	BURP ID	Stream	SMI		SFI		SHI		Average
			Score	Rtng	Score	Rtng	Score	Rtng	
03	1993STWFA016	Spring Creek	—No data collected—						
03	2010SDEQA201	Spring Creek	—Denied access—						
03	2010SDEQA201	Spring Creek	—Beaver complex—						

2.4.26.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-26:

1. Most stream segments comprising AU ID17040220SK026_02 are ephemeral.
2. The lowest extent of the Spring Creek 2nd-order channel has perennial water resulting from beaver pond complexes.
3. The majority of AU ID17040220SK004_03 is ephemeral.
4. The upper extent of the Spring Creek 3rd-order channel has perennial water resulting from beaver pond complexes.
5. Spring Creek Reservoir, McHan Reservoir, and a failed reservoir in lower Spring Creek were placed historically for irrigation storage and delivery (Figure 126). This system has been abandoned for irrigation storage and delivery. The structures are in varied states of repair and only retain runoff and shallow depths for a short duration into the summer.



Figure 126. Failed reservoir in AU ID17040220SK026_03. View from dam looking upstream (south).

Flow

Flows were collected for Spring Creek at sampling location 17040220-26A, 500 meters upstream of Pioneer Reservoir Road (Figure 127).

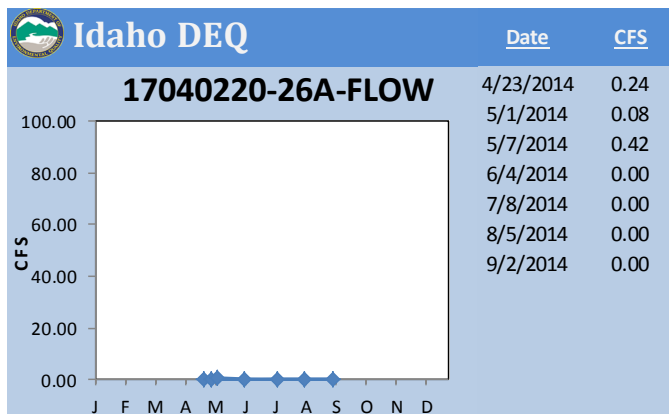


Figure 127. Flow at 17040220-26A, 2014.

Past Conditions

The 2005 Camas TMDL did not disclose any information specific to the water quality or beneficial uses for US-26.

Current Conditions

DEQ sampled this water body from April 2014 through September 2014 (Figure 128). These efforts included composite grab samples for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli*. When possible, flows were measured to allow for instantaneous pollutant load calculations (Table 173).



Figure 128. Sample site 17040220-26A, 4/28/2014 and 8/05/2014.

Table 173. Spring Creek (US-26) water chemistry.

17040220-26A Spring Creek							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	Total Suspended Solids	E. coli	Flow
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100 mL	ft ³ /sec
4/23/2014	<0.010	<0.010	0.45	0.13	<5.0	1.0	0.236
5/1/2014	--	--	--	--	--	--	0.082
5/7/2014	<0.010	<0.010	0.55	0.14	<5.0	21.1	0.423
6/4/2014	--	--	--	--	--	--	dry
7/8/2014	--	--	--	--	--	--	dry
8/5/2015	--	--	--	--	--	--	dry
9/2/2014	--	--	--	--	--	--	dry

Nutrients

Sampling in 2014 included analysis for TP, ammonia, TKN, and TN. Samples were collected at location 17040220-26A to represent nutrient discharge into downstream waters. This sample site is located on AU ID17040220SK026_03, 500 meters upstream from Pioneer Reservoir Road. Nutrients specific to ID17040220SK026_02 were not reviewed in 2014.

To explain nutrient conditions in the water body, TN:TP ratios and instantaneous daily loads for TP have been calculated for each sample event (Table 174). The ratio of TN to TP is used to identify potential nutrient limitations in the water body.

Table 174. Spring Creek (US-26) nutrient summary.

17040220-26A Spring Creek						
Nutrients						
Sample Month	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	TN:TP Ratio	Limits¹	TP Load²
	mg/L	mg/L	mg/L			lbs/day
April	<0.010	0.45	0.13	3.5	N Limiting	0.003
May	<0.010	0.55	0.14	4.0	N Limiting	0.005
June	--	--	--	--	--	--
July	--	--	--	--	--	--
August	--	--	--	--	--	--
September	--	--	--	--	--	--
1 TN:TP ratios -- Values > 16 = P Limiting Values < 10 = N Limiting						
2 (TP [mg/l] *0.08982555)Flow [ft3/sec] = TP load [lbs/day]						

Sediment/Total Suspended Solids

Sampling in 2014 included analysis for TSS. Samples were collected at location 17040220-26A to represent TSS discharge into downstream waters (Table 175). This site is located 500 meters upstream from Pioneer Reservoir Road.

Table 175. Spring Creek (US-26) total suspended solids.

17040220-26A Spring Creek			
Total Suspended Solids			
Sample Date	TSS	Flow	TSS Load¹
	mg/L	ft3/sec	tons/year
April	<5.0	0.236	0.02
May	<5.0	0.423	0.03
June	--	dry	--
July	--	dry	--
August	--	dry	--
September	--	dry	--
1 (TSS [mg/l] *0.016393163)Flow [ft3/sec] = TSS load [tons/year]			

E. coli

Sample analysis results for *E. coli* in 2014 in Spring Creek are displayed in Table 176 and do not indicate any *E. coli* concentrations above trigger values.

Table 176. Spring Creek (US-26) *E. coli*.

17040220-26A Spring Creek			
Bacteria			
Sample Date	<i>E. coli</i>	Flow	Trigger¹
	MPN/100mL	ft³/sec	
April	1.0	0.236	--
May	21.1	0.423	--
June	--	dry	--
July	--	dry	--
August	--	dry	--
September	--	dry	--
¹ > 406cfu/100ml for Primary Contact Recreation > 576 cfu/100ml for Secondary Contact Recreation			

Temperature

A thermograph was deployed in this water body to capture hourly water temperature measurements. The temperature plot for 5/01/2014–5/31/2014 is displayed in Figure 129. The plot indicates that this location had zero exceedances of the instantaneous numeric criteria of 22 °C for the CWAL beneficial use as defined in IDAPA 58.01.02.250.02.b during the measurement period. Analysis of this temperature data set confirms that the instantaneous criterion was not exceeded. Additionally, no daily average exceeded the criteria of 19 °C during the measurement period.

A complete exceedance analysis is in Appendix A.

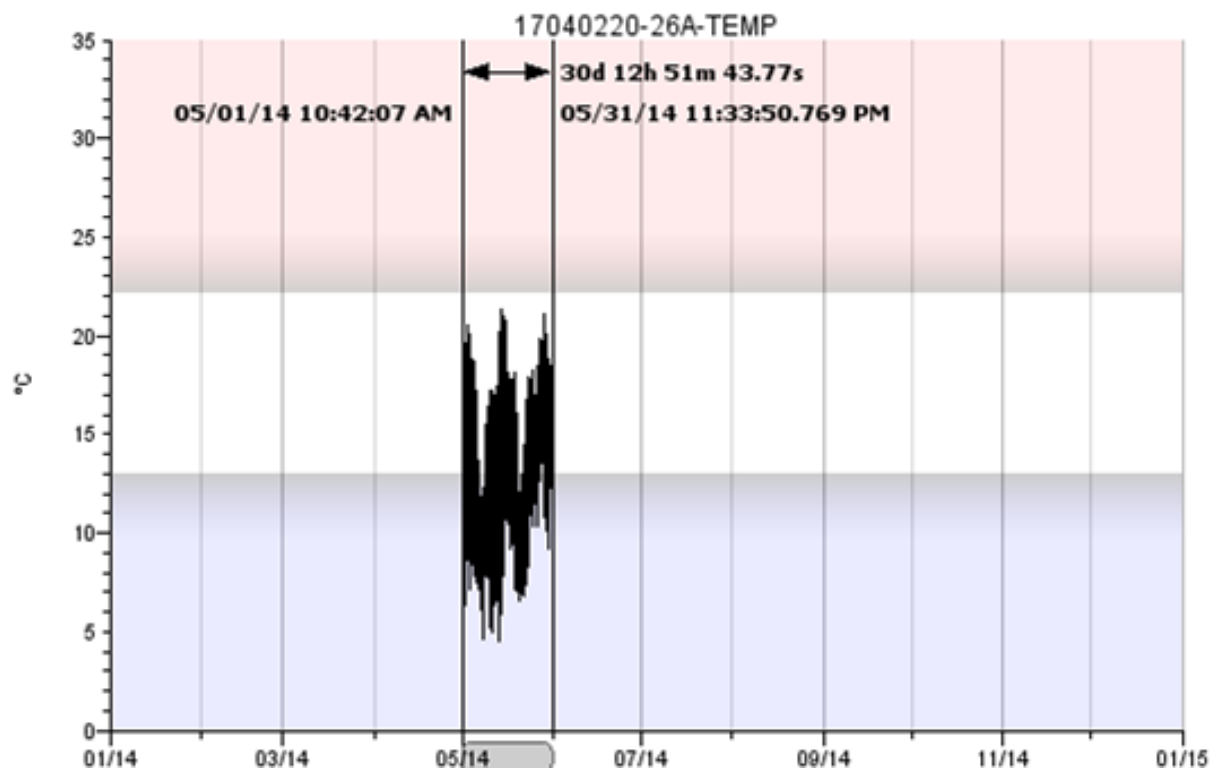


Figure 129. Spring Creek (US-26) thermograph.

2.4.26.3 TMDL Targets, Loads, and Status

No TMDLs were developed for the AUs in this water body.

2.4.27 Kelly Reservoir (US-27)

For an overview of this WBID, see Figure 130.

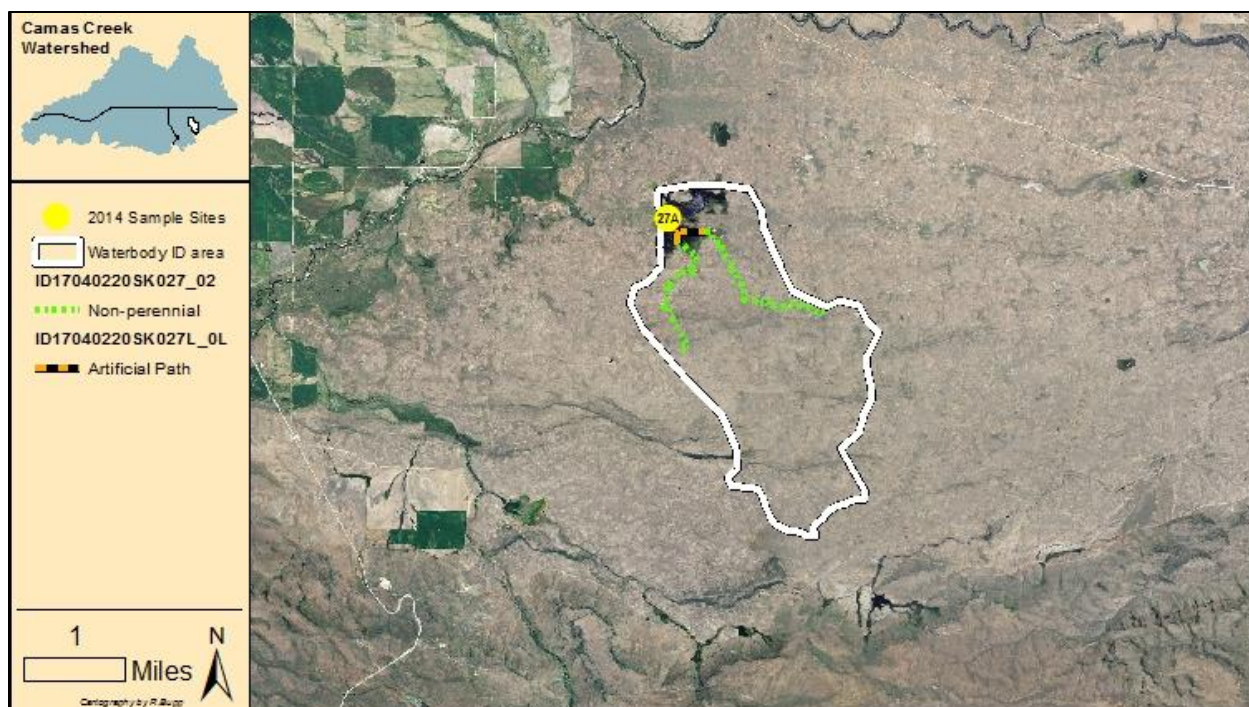


Figure 130. WBID US-27, Kelly Reservoir.

2.4.27.1 Assessment Units

AU ID17040220SK027_02 includes the 1st-order tributaries contributing to Kelly Reservoir, totaling 3.12 miles. Segments are ephemeral, exhibiting flows in direct response to snowmelt and precipitation events.

AU ID17040220SK027L_0L is Kelly Reservoir. The surface area at full capacity is 95.92 acres (Table 177).

Table 177. Kelly Reservoir (US-27) assessment units.

Idaho's 2012 Integrated Report				AU		Stream Segment				
Category 3: Unassessed Waters				ID17040220SK027_02		Kelly Reservoir – 1st order tribs 3.12 MILES				
				ID17040220SK027L_0L		Kelly Reservoir 95.92 ACRES				
Beneficial Use		_02	_0L	Causes			Reference			
Agricultural water supply		NA	NA							
Industrial water supply		NA	NA							
Wildlife habitat		NA	NA							
Aesthetic		NA	NA							
AU order	BURP ID	Stream	SMI		SFI		SHI		Average	
			Score	Rtng	Score	Rtng	Score	Rtng		
—No BURP sites—										

2.4.27.2 Water Quality and Pollutants

General Observations

Flow, habitat, and use observations during 2014 identified a few notable factors that drive the water quality conditions within WBID US-27:

1. All stream segments comprising AU ID17040220SK027_02 are ephemeral.
2. AU ID17040220SK027L_0L is Kelly Reservoir. Water depths are dependent on capture of local runoff, primarily from two small ephemeral drainages (AU ID17040220SK027_02).
3. The water level in Kelly Reservoir was very shallow when sampling visits began in April 2014. Collected samples were representative of these shallow conditions only and not representative of a full capacity reservoir.

Flow

Surface flow is not a parameter appropriate to describe conditions in a reservoir. Quantitative flow information is not available for the unnamed tributaries to the reservoir.

Past Conditions

The 2005 Camas TMDL did not disclose any information specific to the water quality or beneficial uses for US-27.

Current Conditions

DEQ visited this water body for sampling from April 2014 through September 2014 (Figure 131). Grab samples were collected for lab analysis of ammonia, TKN, TN, TP, TSS, and *E. coli* (Table 178).



Figure 131. Kelly Reservoir (US-27), 4/23/2014 and 7/01/2014.

Table 178. Kelly Reservoir (US-27) water chemistry.

17040220-27A Kelly Reservoir							
Sample Date	Ammonia as N	Nitrogen, Nitrate-Nitrite	Total Kjeldahl Nitrogen	Total Phosphorus	Total Suspended Solids	E. coli	Reservoir Condition
	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100 mL	
4/23/2014	0.046	<0.010	6.4	0.76	130	23.3	low
5/6/2014	0.025	<0.010	4.6	0.43	34	8.4	choppy, low
6/3/2014	0.2	<0.010	10	0.95	41	4.1	choppy, low
7/1/2014	--	--	--	--	--	--	dry
8/5/2014	--	--	--	--	--	--	dry
9/3/2014	--	--	--	--	--	--	dry

Extreme low water levels during 2014 sampling presented conditions that are unique to shallow, impounded reservoirs. These conditions should not be considered representative of this water body at full or near-full levels.

2.4.27.1 TMDL Targets, Loads, and Status

No TMDLs were developed for the AUs in this water body.

References

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Grafe, C.S., C.A. Mebane, M.J. McIntyre, D.A. Essig, D.H. Brandt, and D.T. Mosier. 2002. *Water Body Assessment Guidance*, 2nd ed. Boise, ID: Idaho Department of Environmental Quality.

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IDAPA. 2012. "Idaho Water Quality Standards." Idaho Administrative Code. IDAPA 58.01.02.

Appendix A. Temperature Exceedance Analyses

US-2 Camp Creek

DEQ Summary of Temperature Data

Data Source: DEQ-TFRO thermo S/N:9946975

HUC4 Number: 17040220

Water Body: ID17040220SK002_03

HUC4 Name: Camas

Data Collection Site: 17040220-02A; Camp Creek

Idaho Bull Trout Elevation: N/A (m)

Data Period: 4/8/2014 - 7/01/2014

Waterbody ID Number:

Dbase Day Count	Date of Measurement	High Temp	Low Temp	Average Temp	BullExcd J-juvnl S-spawn	Nbr of Msr mts per day	7-Day Average of High
1	9-Apr-14	15.72	6.51	10.36		24	0.00
2	10-Apr-14	14.72	6.20	9.61		24	0.00
3	11-Apr-14	15.68	5.57	9.88		24	0.00
4	12-Apr-14	15.63	6.69	10.25		24	0.00
5	13-Apr-14	15.29	6.66	9.97		24	0.00
6	14-Apr-14	14.89	3.67	8.76		24	0.00
7	15-Apr-14	12.73	5.18	8.29		24	14.95
8	16-Apr-14	14.74	4.30	8.50		24	14.81
9	17-Apr-14	16.25	4.40	9.75		24	15.03
10	18-Apr-14	16.03	8.49	11.44		24	15.08
11	19-Apr-14	16.82	5.82	10.78		24	15.25
12	20-Apr-14	15.89	6.74	10.99		24	15.34
13	21-Apr-14	15.18	5.20	10.21		24	15.38
14	22-Apr-14	12.05	7.87	10.45		24	15.28
15	23-Apr-14	13.40	3.46	7.96		24	15.09
16	24-Apr-14	12.85	5.95	8.82		24	14.60
17	25-Apr-14	11.37	7.67	9.17		24	13.94
18	26-Apr-14	13.23	6.86	9.20		24	13.42
19	27-Apr-14	12.97	4.48	8.08		24	13.01
20	28-Apr-14	14.22	3.48	8.14		24	12.87
21	29-Apr-14	14.48	3.48	8.68		24	13.22
22	30-Apr-14	15.15	5.10	9.97		24	13.47
23	1-May-14	16.53	6.99	11.55		24	13.99
24	2-May-14	17.03	9.21	13.06		24	14.80
25	3-May-14	14.77	9.83	12.69		24	15.02
26	4-May-14	14.12	10.59	12.70		24	15.19
27	5-May-14	13.33	10.59	11.79		24	15.06
28	6-May-14	11.49	9.48	10.30		24	14.63
29	7-May-14	10.42	8.64	9.67		24	13.96
30	8-May-14	11.35	7.34	9.36		24	13.22
31	9-May-14	13.38	9.16	11.20		24	12.69
32	10-May-14	11.59	8.02	10.15		24	12.24
33	11-May-14	12.10	7.99	10.20		24	11.95
34	12-May-14	12.22	9.34	10.87		24	11.79
35	13-May-14	12.46	8.74	10.76		24	11.93
36	14-May-14	13.16	9.48	11.49		24	12.32
37	15-May-14	14.29	11.01	12.67		24	12.74
38	16-May-14	15.15	12.77	13.73		24	13.00
39	17-May-14	15.25	12.36	13.64		24	13.52
40	18-May-14	14.84	12.34	13.12		24	13.91
41	19-May-14	13.93	10.81	12.06		24	14.15
42	20-May-14	12.05	10.71	11.45		24	14.10
43	21-May-14	12.27	10.39	11.32		24	13.97
44	22-May-14	13.95	10.47	12.20		24	13.92
45	23-May-14	15.82	11.90	13.37		24	14.02
46	24-May-14	15.13	12.68	13.79		24	14.00
47	25-May-14	15.25	12.65	13.91		24	14.06

Calibration Factor : 0

Idaho Cold Water Aquatic Life

Criteria Exceedance Summary

Criteria	Exceedance Counts	
	Nmbr	Prct
22 °C Instantaneous	0	0%
19 °C Average	0	0%
Days Evaluated & Date Range	92	22-Jun

Idaho Salmonid Spawning

Criteria Exceedance Summary

Criteria	Exceedance Counts	
	Nmbr	Prct
13 °C Instantaneous Spring	36	78%
9 °C Average Spring	44	96%
Spring Days Eval'd w/in Dates	46	15-Apr
13 °C Instantaneous Fall	1	3%
9 °C Average Fall	0	0%
Fall Days Eval'd w/in Dates	31	15-Sep
13 °C Instantaneous Total *	37	48%
9 °C Average Total *	44	57%
Tot Days Eval'd w/in Both Dates *	77	

* If spring & fall dates overlap double counting may occur.

Idaho Bull Trout

Criteria Exceedance Summary

Criteria	Exceedance Counts	
	Nmbr	Prct
13 °C Juvnl Rearing MWT (J)	0	0%
Juvenile Days Eval'd w/in Dates	0	1-Jun
9 °C Spawning Daily Ave (S)	0	0%
Spawning Days Eval'd w/in Dates	0	1-Sep

NOTES

Thermograph was removed 7/2/2014. Streamflow was zero remained zero through last visit in October 2014.

DEQ Summary of Temperature Data

Data Source: DEQ-TFRO thermo S/N:9946975

HUC4 Number: 17040220

Water Body: ID17040220SK002_03

HUC4 Name: Camas

Data Collection Site: 17040220-02A; Camp Creek

Data Period: 4/8/2014 - 7/01/2014

Idaho Bull Trout Elevation: N/A (m)

Waterbody ID Number:

Dbase Day Count	Date of Measurement	High Temp	Low Temp	Average Temp	BullExcd J. juvnl S-spawn	Nbr of Msrmts per day	7-Day Average of High
48	26-May-14	16.73	13.19	14.39		24	14.46
49	27-May-14	16.13	13.19	14.33		24	15.04
50	28-May-14	16.20	12.85	13.95		24	15.60
51	29-May-14	15.51	10.42	12.52		24	15.82
52	30-May-14	15.18	10.54	12.42		24	15.73
53	31-May-14	15.39	12.00	13.12		24	15.77
54	1-Jun-14	15.58	11.83	13.10		24	15.82
55	2-Jun-14	15.80	11.25	13.08		24	15.68
56	3-Jun-14	16.53	12.63	13.82		24	15.74
57	4-Jun-14	16.42	12.15	13.64		24	15.77
58	5-Jun-14	15.63	11.71	13.18		24	15.79
59	6-Jun-14	16.61	10.66	12.67		24	15.99
60	7-Jun-14	17.84	10.49	12.56		24	16.34
61	8-Jun-14	20.39	8.15	12.24		24	17.03
62	9-Jun-14	16.61	7.04	11.57		24	17.15
63	10-Jun-14	23.28	9.14	14.21		24	18.11
64	11-Jun-14	22.47	7.44	13.15		24	18.97
65	12-Jun-14	25.16	7.44	14.82		24	20.34
66	13-Jun-14	19.27	9.56	13.41		24	20.72
67	14-Jun-14	20.58	7.27	12.34		24	21.11
68	15-Jun-14	15.89	6.59	11.65		24	20.46
69	16-Jun-14	12.85	7.95	10.11		24	19.93
70	17-Jun-14	12.02	4.40	9.07		24	18.32
71	18-Jun-14	11.95	10.35	11.03		24	16.82
72	19-Jun-14	13.31	10.25	11.69		24	15.12
73	20-Jun-14	15.51	12.27	13.35		24	14.59
74	21-Jun-14	14.98	11.71	13.29		24	13.79
75	22-Jun-14	16.75	11.71	13.53		24	13.91
76	23-Jun-14	22.20	8.99	14.75		24	15.25
77	24-Jun-14	25.21	10.12	16.47		24	17.13
78	25-Jun-14	21.10	12.53	16.87		24	18.44
79	26-Jun-14	21.96	13.26	16.87		24	19.67
80	27-Jun-14	21.99	11.39	15.43		24	20.60
81	28-Jun-14	22.82	10.35	15.37		24	21.72
82	29-Jun-14	24.34	8.74	15.95		24	22.80
83	30-Jun-14	24.46	8.72	15.42		24	23.13
84	1-Jul-14	17.82	9.46	11.88		12	22.07

Calibration Factor : 0

STATISTICS

Maximum Daily Maximum (MDM)	20.0 °C
Maximum 7-Day Maximum (MWM)	18.3 °C
Maximum Daily Average (MDA)	15.7 °C
Maximum 7-Day Average (MWA)	13.2 °C
Mean Daily Maximum	14.4 °C
Mean Daily Average	10.6 °C
Mean Daily Minimum	6.8 °C
Minimum 7-Day Minimum	2.0 °C
Minimum Daily Minimum	2.0 °C
Mean of all Data	10.6 °C

EPA Bull Trout

Criteria Exceedance Summary

Criteria	Exceedance Counts	
	Nmbr	Prct
10 °C 7-Day Avg of Daily Max	109	93%
Nmbr of 7-Day Avg's w/in Dates	117	1-Jun

Seasonal Cold Water

Criteria Exceedance Summary

Criteria	Exceedance Counts	
	Nmbr	Prct
26 °C Instantaneous	0	0%
23 °C Average	0	0%
Days Evaluated and Date Range	92	22-Jun

US-3 Willow Creek

DEQ Summary of Temperature Data

Data Source: 17040220-03A-TEMP_2014.09.17

HUC4 Number: 17040220

Water Body: US-3; Willow Creek

HUC4 Name: Camas

Data Collection Site: ID17040220SK003_04, 17040220-03A

Data Period: 5/31/2012 - 10/15/2012

Idaho Bull Trout Elevation: 1000 (m)

Waterbody ID Number: US-3

Dbase Day Count	Date of Measurement	High Temp	Low Temp	Average Temp	BullExcd Juvnl S-spawn	Nbr of Msrms ts per day	7-Day Average of High
1	1-Sep-13	18.52	11.04	13.72		24	0.00
2	2-Sep-13	16.90	12.11	14.01		24	0.00
3	3-Sep-13	18.43	12.50	15.40		24	0.00
4	4-Sep-13	19.19	15.57	17.16		24	0.00
5	5-Sep-13	17.28	15.09	16.14		24	0.00
6	6-Sep-13	19.76	14.42	17.05		24	0.00
7	7-Sep-13	17.28	13.65	15.69		24	18.19
8	8-Sep-13	16.81	13.56	15.14		24	17.95
9	9-Sep-13	16.71	12.40	14.29		24	17.92
10	10-Sep-13	17.00	12.21	14.10		24	17.72
11	11-Sep-13	16.71	11.82	13.84		24	17.37
12	12-Sep-13	17.38	12.98	14.51		24	17.38
13	13-Sep-13	16.62	12.59	13.99		24	16.93
14	14-Sep-13	18.05	13.17	16.23		24	17.04
15	15-Sep-13	17.76	13.46	15.62		24	17.18
16	16-Sep-13	17.76	13.75	15.53		24	17.32
17	17-Sep-13	15.19	12.88	13.93		24	17.07
18	18-Sep-13	14.90	10.65	12.28		24	16.81
19	19-Sep-13	15.00	9.27	11.49		24	16.47
20	20-Sep-13	15.38	9.37	11.67		24	16.29
21	21-Sep-13	14.80	10.06	12.03		24	15.83
22	22-Sep-13	15.95	9.97	11.92		24	15.57
23	23-Sep-13	15.76	9.97	11.75		24	15.28
24	24-Sep-13	12.01	9.87	10.72		24	14.83
25	25-Sep-13	11.14	9.37	10.16		24	14.29
26	26-Sep-13	11.63	8.98	9.94		24	13.81
27	27-Sep-13	13.56	8.28	10.05		24	13.55
28	28-Sep-13	12.79	9.27	10.70		24	13.26
29	29-Sep-13	11.33	10.55	10.89		24	12.60
30	30-Sep-13	12.40	10.16	11.10		24	12.12
31	1-Oct-13	11.14	7.98	9.76		24	12.00
32	2-Oct-13	10.45	8.08	9.36		24	11.90
33	3-Oct-13	9.57	7.68	8.59		24	11.61
34	4-Oct-13	11.43	6.98	8.67		24	11.30
35	5-Oct-13	11.53	6.37	8.60		24	11.12
36	6-Oct-13	12.30	7.28	9.21		24	11.26
37	7-Oct-13	12.30	7.98	9.69		24	11.25
38	8-Oct-13	12.69	8.28	9.86		24	11.47
39	9-Oct-13	12.40	7.78	9.56		24	11.75
40	10-Oct-13	12.98	8.08	9.83		24	12.23
41	11-Oct-13	12.69	7.68	9.52		24	12.41
42	12-Oct-13	12.01	8.18	9.61		24	12.48
43	13-Oct-13	11.53	8.98	10.01		24	12.37
44	14-Oct-13	11.43	8.08	9.36		24	12.25
45	15-Oct-13	12.21	7.78	9.37		24	12.18
46	16-Oct-13	10.94	6.67	8.51		24	11.97
47	17-Oct-13	11.72	6.57	8.54		24	11.79

Calibration Factor : 0

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Eval'd & Date Range	92	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prcnt	
13 °C Instantaneous Spring	36	78%	
9 °C Average Spring	44	96%	
Spring Days Eval'd w/in Dates	46	15-Apr	15-Jul
13 °C Instantaneous Fall	1	3%	
9 °C Average Fall	0	0%	
Fall Days Eval'd w/in Dates	31	15-Sep	15-Nov
13 °C Instantaneous Total *	37	48%	
9 °C Average Total *	44	57%	
Tot Days Eval'd w/in Both Dates *	77		

* If spring & fall dates overlap double counting may occur.

Idaho Bull Trout Criteria Exceedance Summary			
Criteria	Exceedance Counts		
	Nmbr	Prcnt	
13 °C Juvnl Rearing MWT (J)	0	0%	
Juvenile Days Eval'd w/in Dates	0	1-Jun	31-Aug
9 °C Spawning Daily Ave (S)	0	0%	
Spawning Days Eval'd w/in Dates	0	1-Sep	31-Oct

NOTES

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Appendix B. Nitrogen Ratio Algorithms

Richard Bupp

From: Balthasar Buhidar
Sent: Thursday, January 30, 2014 5:53 PM
To: Richard Bupp
Cc: Balthasar Buhidar
Subject: Nitrogen Summary

Rich:

Here are the algorithms I used in the Upper Snake Rock TMDL (1999/2000):

TKN = Total Kjeldahl Nitrogen
NH3 = Total Ammonia Nitrogen (but sometimes they use Total Ammonium N)
NOx = Total Nitrate + Nitrite

Total Dissolved Organic Nitrogen (TON) = TKN – NH3

Total Inorganic Nitrogen (TIN) = NOx + NH3

Total Nitrogen (TN) = TKN + NOx

So the TN:TP Ratio would be governed by (TKN + NOx):TP

Values > 16 = P Limiting
Values < 10 = N Limiting

Essentially, the Total Nitrogen = Organic N + NH3 + NOx (according to some authors)

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